

California *Oenothera* Species

LESTER ROWNTREE

I WISH I had some sort of little gauge which I could apply to my field notes and which would indicate how much by enthusiasm (or lack of enthusiasm) in the description of a plant is due to that plant's actual beauty and desirability and how much to the conditions under which the notes were written. The best I have been able to do so far is to put an explanatory word or two at the end of my note,—“too cold to enthuse, though the plant is really nice,” I find, or—“it may be the coffee,” which means that an unaccustomed debauch may account for my exuberance, or merely—“getting desperate” which speaks for itself.

Then I always have a horrified fear that a wave of nostalgia, flooding over me when I am writing my notes into an article, will affect my values. On a rainy winter day, for instance, I may have just come across my chipmunk-nibbled beret or my disreputable leather coat, with a resultant attack of homesickness for some mountain top or desert wash which would color any flower picture rose-pink, while a memento of a mosquito-swarming swamp at the edge of a snowbank might be enough to damn an innocent and deserving species.

However, the *Oenothera* season doesn't lead one into any great extremes and I ought to be able to handle it fairly sanely.

Americans ought to have an especial interest in Evening Primroses because they are almost entirely American,—North or South—and L. H. Bailey says that from ninety to one hundred of the known species are natives of North America. They are scattered over

many of the states. Large-flowered, quick-spreading *Oe. speciosa* grows in Kansas and Oklahoma and Texas and is an occasional escape in California, and its pink-flowered variety known as “Childs' Mexican Primrose” comes from Texas. Both of them are rampant perennials in many temperate climate gardens. *Oe. biennis* is called the European Evening Primrose, because it has naturalized itself there so freely; but it went to Europe from Virginia, and has now returned to grow, with many similar yellow-flowered species and horticultural forms, in countless American gardens.

California has a large allotment of native Evening Primroses, both perennials and heat and drought-loving annuals, and few of them are very well known to gardeners. Botanists are still treating the genus *Oenothera* as though it were a baseball diamond on which the species names can be endlessly batted about, but the end of the game seems to be in sight. To drop the metaphor, I expect soon to find all the identification of species permanently settled and a final and fixed name attached to every Evening Primrose.

Because of my field work, I have grown accustomed to thinking of the Evening Primroses as arranged in certain groups,—not botanical groups, nor strictly according to life-zones. Rather, each group is associated with the route of one of my annual field trips, and I shall follow this rather personal scheme here, describing a few flowers from each of my yearly flower-hunting trips into various California regions.

Few Evening Primroses like sloppily wet places. Most of them prefer

to grow in comparatively dry spots and to send their roots down into sand or loam. But *Oenothera subacaulis* likes to grow in plain sandy muck, with low-growing, moisture-loving *Mimulus* species of the high mountains as its companions. You don't see this *Oenothera* every day; generally you have to cross the crest of the Sierra and hunt for it in the mountain meadows high up on the eastern side. But it is a choice little thing. Its red-purple-veined and purple-edged, entire, lanceolate-ovate leaves grow in rosettes at the tops of thick roots and make nice settings for the short-stemmed erect yellow flowers. (The whole plant suggests a little *Oe. ovata*.) It begins to leaf out when the meadow is wet and boggy and flowers in June when the soil is still moist. If you visit it at seed-time you find that it follows the custom of many California plants and times its seed ripening to coincide with the drying out of the soil it grows in.

Oenothera graciliflora is a cheerful little annual Evening Primrose of the hills and plains of north central California. Its narrow, entire, hairy gray-green leaves make a tuft rather than a rosette, out of which rise erect reddish flower-stems holding hairy, poppy-like buds and pleasant little yellow bowls. There is nothing at all brash about *Oe. graciliflora*. Even its seed-pods are neat little four-sided boxes tucked carefully in at the base of the plant.

The great majority of California's Evening Primroses grow where they can bask in heat and can dry themselves off thoroughly in the summer. On the hot slopes which edge the deserts, on the sides of canyons and washes, and on sandy plains grow several perennial, biennial and annual species with huge white, usually fragrant flowers. Among these are *Oe. deltoidea* (sometimes called *Oe. trichocalyx*),

Oe. californica, and *Oe. caespitosa* var. *marginata* (sometimes offered as *Oe. marginata*).

Oe. deltoidea and its varieties, annual and sometimes biennial, are the white flowers the tourists see,—and become breathless about—when they go down to Palm Springs, that desert suburb of Hollywood, and travel through mile after mile of the blossoms, growing either alone or mixed with the bright cerise Sand Verbena. When I throw my sleeping bag down among these Evening Primroses and go to sleep there, I find the fragrance, in the night, almost overpowering. But when the sun rises, (and it rises shockingly early on the desert), the perfume begins to die away.

The three-inch white saucers of *Oe. deltoidea*, shading into greenish-yellow at the center, do not close entirely unless their time has come, but fold a little during the noonday glare. In the afternoon they stretch wide again and are joined by the newly opening buds, all ready for another night. The long entire or sub-entire leaves are silvery green, the nodding shaggy buds are a silvery lavender pink, the white flowers turn rose pink as they age; all combine to make an exquisite decoration which is enhanced or subdued by the changing lights of the desert.

The *Oenothera deltoidea* plant is either prostrate or ascending and in size anywhere from an inch-wide baby seedling to its yard-wide parent, which looks like an old hen surrounded by chicks of odd sizes. When the summer heat of the desert reaches its peak, *Oe. deltoidea* is ready for it, being by now nothing but a bundle of dried stems. If the plant is sufficiently ambitious it gathers its stems about it, shakes its dessicated root loose from the earth and, helped by the wind, trundles off on its travels, spilling its ripened seed as it goes. But if the



Lester Rowntree

Oenothera brevipes

plant is by chance growing in a garden it must resign itself to a tame old age, for it will have had too much moisture to get itself in condition for this final fling.

I am continually amazed to find how well English gardeners succeed with plants of the California desert, but I get reports, from that cold, wet little island, filled with boundless praise for *Oe. deltoidea* as a guest which for beauty, fragrance, wealth of blossoms and general delightfulness "will please the most fastidious and critical."

The perennial *Oenothera californica* (*Oe. pallida* var. *californica*) is often mistaken for *Oe. deltoidea* but it is usually a taller plant and is silvery with hairs. You find large stands of it on the slopes of desert-facing mountains. All heat-loving *Oenotheras* are at their best on dull days but *Oe. californica* is especially beautiful after rain, when

the silvery foliage glistens with moisture and the nodding buds and open flowers hold shining drops. *Oe. californica* grows up to an altitude of 8,000 feet, likes loose gravelly soil and can stand any amount of wind.

Oenothera caespitosa var. *marginata* is more common in the states to the north and east of California than it is in California itself. There is so little botanical difference (a matter of hairs, I believe) between the type and its varieties that one finds each called by the name of the other or var. *marginata* considered a separate species. At any rate, whatever you call it, it is a nice white-flowered hardy perennial Evening Primrose for the garden, though I haven't found it very longlived.

Its dentate gray-green leaves, in a basal rosette, make a nest for the big white flowers, whose petals are more sharply narrowed at the base than are



Lester Rowntree

Oenothera bistorta var. *veitchiana*

those of most Evening Primroses. Since its native habitat is on dry rocky slopes, it is wiser, in the garden, not to give it too heavy or too rich soil but to grow it on a slope with the best of drainage.

The last of this group from hot slopes and mesas is *Oc. primiveris*,—a plant of the mesa in Nevada, Colorado, Utah, and Texas and of the Colorado and Mohave Deserts in California. Although really as annual, you can coax it to behave as a biennial or even perennial if you are growing it in a temperate climate. It makes large flat rosettes of hairy, gray-green, deeply pinnatifid leaves. The huge, fragrant, primrose-yellow flowers, on pale pink calyx-tubes, which lift them a little above the foliage, turn deep pink as they age and are followed by long fat seedpods wedged close round the base of the rosette. I think a mesa

of strawberry-pink-tan earth, scattered over with this yellow Evening Primrose mingled with the erect, deep rich royal purple stalks of little *Lupinus odoratus*, the fragrant golden *Lepidium flavum* and the red-purple *Astragalus Coulteri*, is one of the loveliest of California desert pictures.

The group of tall annual desert Evening Primroses is a huge one. There are yellow-flowered and white-flowered ones and on the whole the yellow species are the more desirable. Individually they are all nice,—unless the flowers are too tiny—while some of them are exceptionally good. Many of them have a lovely thin glistening silver bark on their stems, which curls up and peels off when the plant grows old. Some of them gather their stems round them at the end of their days and go wandering across the wide open spaces, like *Oc. deltoides*. Almost all of them



Lewis Josselyn

Oenothera ovata

begin their growth by developing an erect stem which ends in a flower spike. While that is blooming, the side branches spring out, also ending in flower spikes which come into bloom just as the central one is beginning to set its seed.

California wild flower seasons vary greatly from year to year and depend as much on *when* the rain falls as on *how much* falls. The best of weather prophets usually falls down on predictions about the wild flowers. But the distribution of moisture usually suits at least one genus. In some years it is the Lupins which are pleased,—and show it; on other years the rains may “do right by” the Pentstemons. Nineteen-thirty-seven was a banner year for the Evening Primroses and they took every advantage of their luck. They ramped along the canyon sides, smothered mesas and mountain slopes and in

some places quite covered the sandy floor of the desert.

Oenothera brevipes (one of the tall desert annual group) especially made the most of that year. I have never seen the plants so large or so numerous,—sometimes they seemed to think they were bushes. They grew more than two feet tall, with any number of side branches which reached far out to brush the neighboring plants. And the flowers were innumerable, one scorpion-like spike after another uncurling to shake out its burden of floppy flower bowls like huge buttercups more than an inch and a half across, pale primrose yellow on one bush, bright egg yellow on the next, with their yellow filaments holding up round creamy anthers like little toy balloons. The sun tinted the sturdy stems into shades of red and pink and the small scarlet dots at the base of the petals shone bright.



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Oenothera ovata

And they grew with the nicest companions to set them off,—blue *Phacelia distans* and *Fremontii*, flaring salmon-scarlet *Sphaeralcea ambigua*, blue *Lupinus sparsiflorus*, golden *Eriophyllum ambigua* and many yellow or white-flowered species of their own race.

When they are young there is a good deal of foliage, especially if the seasonal rain has been heavy. As the rains cease and the heat mounts, the leaves dry up they have already begun to shrivel when the last flowers are opening.

Oenothera cheiranthifolia, *Oe. bis-*

torta and *Oe. ovata* all grow near or on the coast, but each is quite different from the others.

Oe. cheiranthifolia (*Oe. spiralis*) is a distinctly beach Primrose, growing on sand dunes and sea beaches and helping gardeners directly on the coast to solve their problem of colorful ground covers. It is a perennial but you can treat it as an annual, sometimes with more satisfaction. The seedlings are beautiful little silver rosettes which throw out long, prostrate, curving flowering stems until the resultant mat is sometimes a yard across. The



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Oenothera cheiranthifolia

flowers, all along the stems, are flat, bright yellow, an inch and a half wide and sometimes flecked with red-brown near the center. In bloom it is lovely,

but after it has gone to seed it looks shabby and gets in the way of other plants, so I prefer to tear my big plants out when they get to this stage and

let the self-sown seedlings take over until they too get out of bounds at the end of the next season.

Oenothera bistorta has varieties which grow far inland but the type sticks pretty closely to the coast, where it grows along the bluffs and in gravelly washes. This green-leaved species also is alluring in the kindergarten stage but may become gangly at adolescence; however, it is an annual and can be pulled out without too much loss. Even in shade it is not so prostrate as the Beach Evening Primrose and in shade the branches are quite definitely ascending. The yellow flowers are comparatively small and may or may not have dark red-brown central spots.

Oenothera ovata or Sun-cups, is like a large *Oe. subacaulis*. Often it begins to bloom in February, its round pads of oblong dull green leaves serving as bases for many slender, creamy, four-inch calyx-tubes carrying inch-wide, oval-petaled, buttercup-yellow flowers. Some pads of leaves measure a foot across and many plants bear from one hundred to two hundred flowers. Sun-cups grows on grassy slopes, often in heavy soil which is fairly moist during the rainy season but which has already begun to crack with dryness while the plants are still in bloom, for its blooming season is a long one. Its companions first yellow *Viola pedunculata*, then the blue Dwarf Lupin (*L. nanus*) and then the deeper blue *Sisyrinchium bellum*, and opens its last flowers with golden *Brodiaea ixioides*, whose flowering is the sign that Spring is over.

I always feel somewhat criminal when I go to collect seed of *Oe. ovata* and I dislike the job for it involves grubbing the plant's root out of its hard soil and performing a Caesarean on it. Since the seed capsules develop underground, packed around the

thick root and embedded in it, this is the only way to get at them. The patient survives the operation, for though I don't sew it up I always replant it carefully and I've checked up enough plants to be sure that they grow and bloom again the next year.

My last Evening Primrose is probably the best known of all and may need no words from me. It is the tall clear yellow one with large flowers (sometimes six inches across) which is occasionally catalogued as *Oe. grandiflora* but more often as *Oe. Hookeri*. I saw it in Mexico, apparently wild, though possibly an escape; it grows in the Rocky Mountains and in several of the western states and in California is the most widespread of the genus. It blooms with tall blue Monks-hood and Lupins in the wet meadows of the high mountains and with golden *Mimulus guttatus* and scarlet *M. cardinalis* on the floors of wet coastal canyons. On my hillside it has appeared among naturalized Foxglove and Cistus, in places which get no water between the last rain of spring and the first one of autumn. You see it growing round farm houses with Cannas and magenta Phlox, the three cooperating to make an effortless decoration.

Oe. Hookeri is an erect plant, sometimes five feet tall, and behaves as annual, biennial or perennial, according to its fancy. It is a rather coarse thing for the flower-bed but grand for the wild garden, where, if you permit, it will make forests among the tall wild grasses. Its flowers are the 2/1 Canary Yellow of the invaluable Horticultural Color Chart published by the Royal Horticultural Society, and are more strictly *evening* Primroses than those of many other species, for they seldom stay open all day, while their lax dull pink two-inch sepals hang down in a limp and curly tangle.

In re-reading what I have written I

*Lester Rowntree**Oenothera grandiflora (Hookeri)*

am rather pleased to have held my enthusiasms in check so well. But my beret and leather jacket were out of

sight and I was working from notes which were fairly legible, always a sign that I was normal when I wrote them.

Bornoa an Endemic Palm of Haiti

O. F. Cook

ONE of the largest and most attractive palms of the West Indian flora, a member of the coconut family, yielding an edible nut, was discovered in Haiti more than two centuries ago, but has remained very little known. A remarkable drawing of the Haitian palm, here reproduced as Figure 1, was published by Charles Plumier in 1703, in advance of detailed information regarding other American palms. Plumier's description of the Haitian palm was published by Martius more than a century later, in 1847, but likewise has received little attention. The palm has been assigned incidentally to South American genera, *Maximiliana* and *Attalea*, with which it agrees in some of its characters, but in others is distinct.

Only a few palms are of the size and proportion to be described as massive or imposing like the date palms, coconuts, and royals, but the Haitian palm sustains comparison with any of these. The foliage resembles that of the coconut palm, an ample crown of leaves with regular spreading pinnae, the chief difference being that the midrib of the leaf is more flexible near the end, turning on the side and forming a graceful curve. The trunk also is different, thicker, smoother and more even than that of the coconut palm, in these respects more like a royal palm. See figures 2 and 3.

From the habits of the palm no reason is apparent why it should not be planted widely in Haiti and in other countries. Many of the tropical palms are specialized for forest conditions and may not thrive in open locations, even in the tropics, but this Haitian

palm apparently is like the coconut in growing with full exposure, and is likely to thrive in Florida, since Haiti also is a limestone country. Seeds have been obtained and seedlings are being raised to test its behavior in Florida, Puerto Rico, and the Canal Zone.

It naturally would be supposed that such a palm would have spread through Haiti, or at least through its native district, from being planted or at least allowed to grow, since the oily kernels of the nuts have an excellent flavor, and have been known from the early days as "little coconuts." That none of these palms should have been raised around Port-au-Prince or Petionville is the more remarkable in view of the hundreds of beautiful, neatly kept gardens surrounding the homes of the well-to-do families, showing the love of flowers and decorative plants as an outstanding trait of the Haitian people.

The chief reason, no doubt, for the palm remaining so completely unknown, even in its native country, is that very few people, if any, of those at Port-au-Prince or at other towns, who have gardens and might be interested in raising some of the palms, have ever seen them. The road that renders the few remaining palms accessible by automobile is of recent construction and the number of palms is so few that they are likely to be passed without being noticed. A better prospect opened in 1920, of the remaining palms being protected and others propagated, through the establishment by the Service Technique d'Agriculture, of a station for experiments with coffee at Fond-des-Negres, the locality where

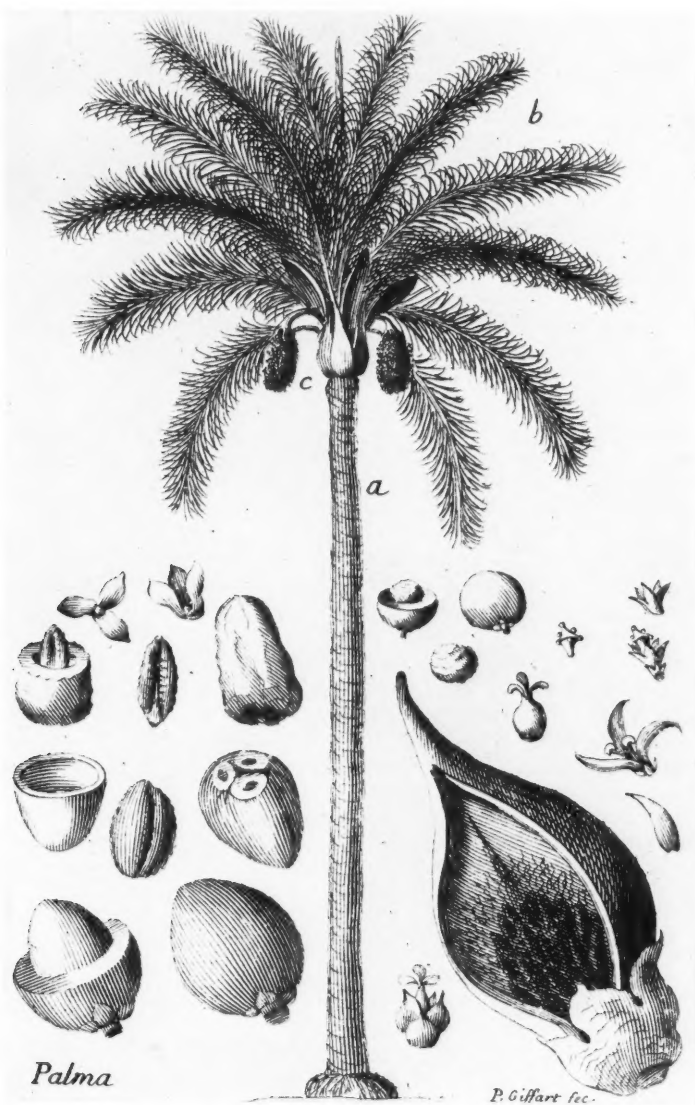


Fig. 1. Plumier's Genus "Palma," 1703

the palms grow, on the road between Leogane and Aux Cayes. It is hoped that measures already have been taken

to increase and utilize the palm in Haiti, and it may be expected that many visitors from other countries will

be interested to see these remarkable palms at Fond-des-Negres and to obtain the seeds in viable condition.

Difficulties in growing the palms in other localities may arise from the seeds being very short-lived, this being true of many of the tropical palms. The perishable seeds must be planted at once, or at least kept somewhat moist in loose leaf mold, weathered charcoal, or slightly dampened moss, if they are to be stored or shipped before being planted. The palm may have a definite fruiting season, so that the nuts may be obtainable for only limited periods and probably are eaten at once by the local children or by the pigs. Most of the palms are rather definitely seasonal, only a few like the coconut bearing a succession of inflorescences through the year. Special arrangements probably will be necessary to obtain supplies of the seeds of *Borhoa* from the few remaining palms, unless the experimental station is being maintained.

Further cautions to be noted by those not accustomed to propagating palms are that several weeks or months may be required for the seeds to germinate, and that the seedlings may make only a slow growth during the early stages of development, even with palms that later grow rapidly, when well established. Many palms have only narrow simple leaves at first, like blades of grass, so that the seedlings often are overlooked and even weeded out from gardens and ornamental grounds without being recognized. Planting in permanent locations is desirable, if protection can be given against grazing animals or other hazards. Since the transplanting of young palms from nurseries often proves difficult, it is safer to raise the seedlings in pots, tubs or boxes. The seedlings of *Borhoa* have simple plicate leaves, as shown in figure 12.

Haiti has many other interesting and

beautiful native palms that would form a very attractive collection, if brought together. Many years would be required, of course, to raise the larger palms to maturity from the seeds, but with some of the species that grow near Port-au-Prince mature or partly grown specimens might be transplanted, if sufficient interest were taken to develop such a collection. The district of Port-au-Prince apparently is protected by the adjacent mountains, and has seldom been visited by hurricanes.

The seeds for the present stock of seedlings were received in September 1938 through the kindness of Mr. B. H. A. Groth, of the Standard Fruit Company, Aux Cayes, Haiti, and were grown under No. 129884. The healthy state of the yearling plants at the stage shown in figure 12 affords no assurance that they will continue to thrive under greenhouse conditions. Open-air planting may be necessary within a year or two.

Further search should be made in the southern peninsula in the hope of finding the palms in larger numbers, and possibly under natural conditions. Verbal information from Dr. Ekman was noted at Port-au-Prince September 5, 1937, of seeing this palm near Pestel, "on the road to Glace." Pestel is shown on several maps of Haiti, on the north coast of the southern peninsula about 40 miles west of Fond-des-Negres and 20 miles east of Jeremie. Another robust pinnate palm that might be confused with *Borhoa* is *Calyptrotonoma quisqueyana* Bailey. It is known to occur in the southern peninsula, but its fruits are smaller than coffee berries, while the nuts of *Borhoa* have the size and shape of pecans.

A second locality reported by Plumier, the Ile a Vache, off the south coast of Haiti near Aux Cayes, has not been confirmed by any later report. Grazing might destroy all the young



Fig. 2. *Borhoa* at Fond-des-Negres, Haiti

palms, and a gradual extinction would result. The island is said to have been used chiefly for cattle.

THE VERGE OF EXTINCTION

That such a palm should be brought to the verge of extinction may seem

difficult to understand, but planting or protecting a long-lived tree is beyond the usual range of interest among primitive people. Cutting and burning the forest is the customary activity, and the extinction of the forest vegetation is the general result. Most of the tropical countries have been largely deforested and denuded, to a much greater extent than usually is recognized, and for longer periods.

In Haiti, as in many other tropical countries, extremely small areas of the original forest remain, and these only on rock exposures or lands too barren or inaccessible to be used, even temporarily, for planting the native crops. The wild stock of *Bornoa* may be entirely extinct, the few palms of Fond-des-Negres being in cultivated land, where no young palms are allowed to grow. Only one seedling was found, and that in a damaged condition.

The many types of plant life that still exist only as accidental survivors or in small remnants of the original forests, leave no doubt that many other types have been completely exterminated. Taking account of the generally limited distribution of forest species, in forests that have not been disturbed, it is seen that hundreds or thousands of species must have been exterminated in the wide regions that appear to have been intensively occupied during long periods.

The lack of wild relatives of so many of the cultivated species may be explained in this way, and the proportion of palms that have been exterminated may have been greater than in the other groups. Only the few cultivated species have been preserved and distributed by human care. The others have survived by mere accident, by being able to grow in the natural wastes that the primitive people could not use, or

to persist after clearing and burning. Most of the trees that spring up in clearings are different from those that grow in the uncut forests, and some of the trees that abound in clearings are widely distributed, like the species of weeds.

Primitive people alone could have little power over plant life, but as soon as fire was adopted a complete devastation of nature became possible, and many regions probably were denuded long before the dawn of history. The heaviest forests give place in time to open grass-lands, no longer to be cleared by burning over, until they have been abandoned and reforested. Grass-lands may be gradually reforested, or by intensive pasturing and burning the land may be completely denuded to the desert stage of drifting sands or sun-baked rock exposures.

Haiti seems to have been well populated at the time of discovery by Columbus, so that a partial denudation may have taken place before the colonial period. The destruction of the mountain forests no doubt was accelerated by the slaves who escaped and joined the surviving Indians, adopting their mode of life and learning their methods of using the native crops, maize, cassava, and yautia, the grain sorghum being the only food staple derived from Africa.

Compared with many other countries, Haiti is still to be considered as populous and fertile, but great areas have been abandoned, that were cultivated in the colonial period. Very steep slopes are now being cleared and intensively used, not by the milpa system of temporary clearing for one or two crops, and then allowing the forest to grow again, but by continuous planting and weeding till the soil deposits among the rocks are exposed and washed away.

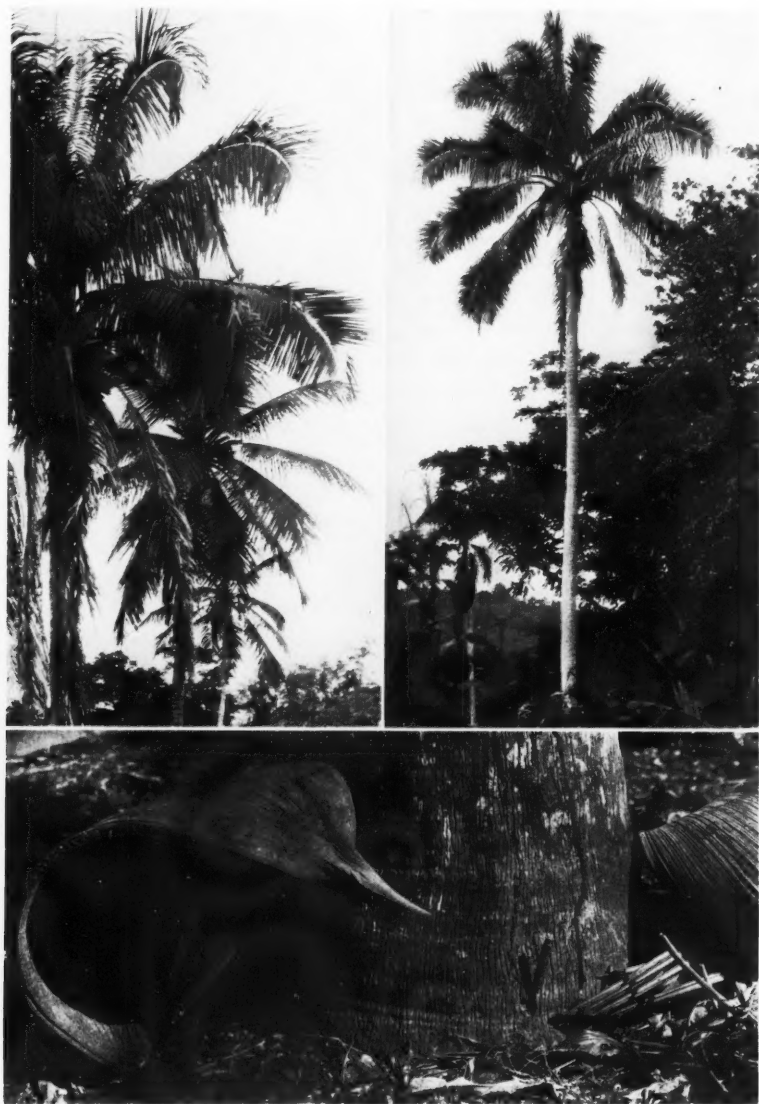


Fig. 3. *Borhoa* foliage and coconut palms, base of trunk and fallen spathes

BORHOA AS A HURRICANE PALM

Palms have obvious advantages over all the branching types of trees in re-

sisting hurricanes, as recognized in the Pacific Islands and in the West Indies, including southern Florida. The co-

conut palm and the royals are the best known examples, but several other resistant types were recognized in a brief paper in *Science* of April 2, 1937, "Hurricane Palms in Florida, including a New Genus *Simpsonia*." Most of the genera of palms that are native in Florida are shared with the West Indies, and several other West Indian palms are obviously specialized for resisting hurricanes. It is important that such differences be recognized, not only for utilizing to a greater extent some of the native palms of Florida but also for recruiting from other countries a suitable flora of cultivated plants.

The principal features that seem to qualify *Borinoa* as a hurricane palm, in comparison with the related types of Guiana and Brazil are the smooth trunk, the compact, closely pinnate leaves, and the very short, robust, heavily armored inflorescence. The indurated perianth of the female flowers, indurated petals of the male flowers and the firm-textured closely coiled stamens also may be viewed as adaptations to conditions of exposure, to wind or drought.

The trunk of *Borinoa* does not have the distinct swelling of the lower part that is a feature of several other West Indian palms, but appears to be expanded at the surface of the ground, being supported on a broad frustum of compact roots. This feature is indicated in Plumier's drawing, but the palm whose basal section is shown in figure 3 stood in a depression where a surface accumulation concealed the roots.

The compact leaves of *Borinoa*, with regular close-set pinnae, are in notable contrast with the slender spreading leaves of the South American genera, *Maximiliana* and *Attalea*. Also the horizontal insertion or attachment of the leaves differs obviously from the upright insertion of the leaves of the

South American genera, the persistent vertical leaf-bases being noted by many writers as an outstanding feature of the *maripa* and *inaja* palms.

GERMINATION AND SEEDLING DEVELOPMENT

As in many other members of the coconut family, the cotyledon of *Borinoa*, carrying the plumule, grows out of the seed and burrows in the ground. The seed may lie on the surface or may be only slightly covered, while the young plant is set two or three inches deep, though still connected with its food supply during the period of germination. The burrowing organ is not a root, but a specialized growth of the lower part of the cotyledon, leaving the upper part in the seed to serve as the nursing-foot, with the usual function of digesting the endosperm to provide for the growth of the plumule.

A name has been sought for this burrowing organ, corresponding morphologically to the sheathing base of the foliage leaf. The function of carrying the plumule away from the seed suggests "apocole" as a suitable term, but caution may be needed not to confuse this word with names proposed by Mirbel for two other organs of the seedling, *colerhiza* for a sheath enclosing an undeveloped radicle, and *coleoptile* for a short sheath enclosing a plumule.

In *Borinoa* the distal extremity of the apocole forms a deep cylindrical sheath enclosing the two bladeless sheaths as well as the young foliage leaves, during the early stages of development. The sheathing section of the apocole might still be described as a coleoptile, but apparently would have no genetic homology with the coleoptile in the royal palm family or in the pacaya family, as illustrated by Martius in seedlings of *Euterpe oleracea*, and in several species of *Chamaedorea*. In these palms

the cotyledon does not elongate, and no apocole is developed.

The apocole of *Bornoa* and other coccoid palms is essentially distinct in being a downward growth, while the coleoptile of "*Euterpe*" and *Chamaedorea* normally grows upward. The radicle and the plumule are basal organs of the cotyledon while the apocole is a product of intercalary growth, an intermediate section of the cotyledon, between the plumule and the nursing-foot, so that the plumule and the radicle are carried downward with the development of the apocole.

Martius defines the coleoptile as the sheath of the cotyledonary body, "*vagina corporis cotyledonci*," and distinguishes three kinds of cotyledonary sheaths with reference to the position of the narrowed portion or petiole, as remote from the "primary node" in *Phoenix* and *Arenga*, adjacent to the "primary node" in *Euterpe* and *Chamaedorea*, and intermediate in *Chamaerops*, where the cotyledonary sheath is ocreate as though attached at one side to the slender stem-like part of the apocole. The expression "primary node" may be interpreted as the seat or place of origin of the radicle and the plumule.

Martius may be said, in the treatment outlined above, to have extended the term coleoptile to the entire burrowing organ, while Lindley in the "Treasury of Botany" identified the coleoptile with the coleophyll and defined it as "the first leaf which follows the cotyledon in endogens, and ensheaths the succeeding leaves." Under Lindley's definition the first bladeless sheath of the palm seedling would be the coleoptile, or coleophyll, probably equivalent to the bladeless sheath of the maize seedling, where the name coleoptile often is used. Lindley's treatment apparently was a departure from the original application of the term by

Mirbel, who described the grasses as having a naked plumule, without a coleoptile.

The radicle or primary root grows downward from the tip of the apocole, but not until this organ has carried the plumule to its permanent position. The apocole of *Bornoa* is of rather soft texture and attains a length of 5 to 10 cm. On the seedling shown at the right of figure 11 the upward growth of the plumule pushed through the apocole near the middle, and carried it upward. The nut was attached at the swelling above the small brush of diverging fibers, these forming a part of the nursing foot, developed inside the seed. The other side of the same seedling plant is shown lower down in the same figure, without the apocole, the first bladeless sheath, about 2.5 cm long, diverging at the right, and the longer second sheath still closely wrapped around the leaf-sheath bundle, the length being nearly the same as the sheaths of the lower leaves, about 3.5 cm, the apex narrow and indurated, to push upward through the soil.

The primary root, shown in figure 12, thickens rapidly to a diameter of 8 to 10 mm, doubtless providing a storage organ for a prompt transfer of the food material from the seed. The thickened upper portion of the primary root may have only a few lateral branches, but these are closely beset with fine short rootlets much more numerous than on the deeper roots. Two secondary roots develop later, one at each side of the primary, as the figure also shows.

The foliage leaves of the seedling have simple plicate blades, rather narrowed at the base but scarcely petiolate, the lower margins almost continuous with those of the leaf-sheaths. The leaf-blades are not erect, but arched and spreading as a rosette, indicating that the palm is not adapted to forest condi-

tions, but to somewhat open places.

The blade of the first leaf, shown at the right of figure 12, attains a length of 15 cm. by 2.5 wide, the second leaf 20 cm. by 3 cm., in the normally plicate condition, or 4 cm. with the folds flattened. The third leaf spreads to nearly 5 cm. and is more deeply plicate, 18 cm. long, but not fully grown. Each of these leaves has a distinct midrib, but very narrow, marked underneath by a thin shining ridge, above by a narrow groove. The folds on each side of the midrib increase in number from 3 or 4 on the first leaf to 6 or 7 on the third. The ribs of the young leaves are somewhat scaly underneath, but soon appear naked, and in the dry state cross-veins are distinct.

BOTANICAL HISTORY OF BORNOA

A longer botanical history may be claimed for *Bornoa* than for any other American palm. Not only the habit of the palm, but numerous structural details of the flowers and fruits, were shown in the first plate of Plumier's "Nova Plantarum Genera," published in 1703, well in advance of corresponding information regarding other American palms. Later botanists, disregarding the characters made known by Plumier, have continued to confuse the Haitian palm with South American genera. The case is parallel to that of *Gastrococos* in Cuba, another remarkable cocoid palm, related to *Acrocomia*, but having several distinctive features, as recognized by Morales in 1865, though generally disregarded.

Plumier's illustration of 1703, here reproduced as figure 1, represented the genus *Palma*, a group that the author considered very difficult to describe on account of the great diversity of the flowers, having found that some were monopetalous and others polypetalous, with some of the flowers fertile and others sterile in the same inflorescence,

or with separate inflorescences for the two kinds of flowers, as happens in *Bornoa*. And here a further complication is reached, of the "female" inflorescences having male flowers as well, while the "male" inflorescences do not produce any functional female flowers, although rudiments of suppressed female flowers may be distinguished at the base of the branches.

Only a Latin diagnosis of the Haitian palm was given: "*Palma cocifera, vaginis ventricosis et latis*," no description or locality, but the drawings are unmistakable, and other data recorded by Plumier were published by Martius in 1897, in the "Palmetum Orbignianum," under the binomial name *Maximiliana crassipatha*. Thus the Haitian palm was associated with a Brazilian species, *Maximiliana regia*, considered by Martius as the most majestic palm of the entire Brazilian flora, and specially dedicated by Martius to his royal patron, Maximilian Joseph, King of Bavaria.

The name *Maximiliana* was set aside by Otto Kunze in 1891, on the ground of being preoccupied by an earlier use by Martius himself, for the tree usually known as *Cochlospermum*. Kuntze proposed to replace *Maximiliana* with *Englerophoenix*, in honor of Professor Adolf Engler of Berlin, but several writers have continued to use *Maximiliana*. Burrit in 1929 transferred the Haitian palm to *Attalea*, in the "Hanging of the Swedish Academy," publishing at the same time three plates of Plumier's remarkable drawings, made in the seventeenth century, preserved at Paris. Plumier made three visits to America, in 1689, 1693, and 1695, and amassed so much material that only fragments of his work were published.

PLUMIER'S ACCOUNT OF BORNOA

The data that Martius published from Plumier's notes doubtless were



Fig. 4. *Bornoa* leaf-sections, upper and lower sides, natural size

based on abundant living material and include several features not readily observed on the few surviving palms.

The trunk attained a height of 80 feet with a diameter of 15-16 inches. The coarse finger-thick roots, of bony hardness, apparently were exposed 2 to 3 feet, forming dense mass at the base of the trunk. The leaves were 16-18 feet long, the pinnae projecting at a right angle, 3-4 feet long, 3 inches wide, deep green on both sides, the stiff yellowish midvein prominent above.

Several inflorescences were produced at the same time, from the axils of the outer leaves. Outer spathe urceolate, only a quarter or a third of the length of the inner spathe, spreading and somewhat bilobed at the end, thick and leathery, woody at the base. The inner spathe 2-3 feet long, ovate, ventricose, nearly a foot broad, with a solid subulate beak, the wall an inch thick, the surface deeply sulcate, the grooves 3-4 lines apart.

The male spadix is described as a huge bundle of golden yellow flowers with a few female flowers at the base of the branches, but these questioned. The other form of inflorescence bore female branches below and males above, which doubtless means that the few female flowers on the upper branches were not noticed.

The fresh fruits are described as ovate-obtuse, 18 lines long and 15 lines in diameter, the small persistent perianth 3 lines long, and the nuts 15 lines long, somewhat smaller than our specimens. The exocarp is noted as yellow, fleshy and fibrous, with a rather pleasant, mucilaginous sweetish taste. Plumier's drawing of the mature fruits, published by Burret, shows a rounded oval form with the apex scarcely angled, with no suggestion of a persistent stigma raised on an indurated base.

In relation to the inflorescence, an error in Plumier's drawing of the palm

may be noted, in showing the clusters of fruit as hanging from the spathes on curved peduncles. Many other palms have the fruit clusters pendent in this manner, but the peduncle is suppressed in the Haitian palm. Plumier's detailed drawing of the spathe at the lower right of figure 1 shows the inflorescence without a peduncle, sessile at the bottom of the spathe, and this is confirmed by the photograph reproduced as figure 5. Also in figure 3 the spathes are shown to be very short, and the spadix not pendent or even protruding. Only in the oil palms, *Elaeis* and *Alfonsia*, are the inflorescences more compact than those of *Bornoa* and *Maximiliana*.

The nuts were known as "*carousiers*" or "*petit cocos*," the first designation possibly modified from the extinct native language. The word *carosse* is defined by Bescherelle as "*fruit du carossier*," and *carossier* as a palm of Guinea.

BORNOA AS A NEW GENUS

A tall stately palm, with a massive columnar trunk, an ample crown of very large leaves and very numerous, regular, close-set complicate pinnae; infloresces dimorphic, male and bisexual, very short, stout and heavily armored, the axis very thick, closely beset with simple bifacial branches, subtended by slender spiniform bracts. Male inflorescences with a short section of suppressed female flowers at the base of each branch, the longer terminal section bearing numerous male flowers, mostly in pairs subtended by a prominent apiculate bract, the pairs often arranged in opposite rows; bisexual inflorescences with female flowers monostichous, confined to a stout basal section of each branch, the slender apical section bearing small male flowers, the stamens perhaps defective; male flowers with minute triangular carinate sepals and large crassate-subulate petals, thickened



Fig. 5. *Female inflorescence of Bornoa, reduced*

and somewhat flattened, not meeting at the margins or covering the stamens, even in the bud; anthers long and closely contorted; fruits and nuts broadly oval, not rostrate; endocarp thin and smooth, with broadly excavate basal foramina, only one carpel fertile.

The type species is *Bornoa crassipatha* (Martius), a nearly extinct species limited to the western part of the southern peninsula of Haiti. The crassate spathe, indurate unguiform male petals and basal excavate foramina are distinctive features. The endosperm is uniform and the embryo slender, about 4 mm. long.

Bornoa is a member of the *Attalea* tribe or subfamily, characterized by dimorphic inflorescences, some exclusively male, the other bisexual, with the female flowers confined to the basal joints of the branches.

TRUNK AND LEAF CHARACTERS

Trunk attaining 20 meters or more, massive and columnar, nearly straight and symmetrical, though not so regularly turned as the royal palm. The trunk shown in figure 3 had a circumference of 224 cm. at the base, narrowing to 152 cm. about one meter from the ground. Trunk sections near the base 15 to 17 cm. long, the leaf-scar notably longer on one side.

Leaves 4.5 meters long, the sheath and petiole 1.5 meters, base of rachis 10.5 cm. wide when dry; pinnae about 200 on a side, about 3 cm. wide, regularly spaced about 2.5 cm. apart, closely folded at the base, as shown in figure 4, the rachis triangular in cross-section, thicker than wide, the terminal portion bending sidewise and turning on edge, as in figure 2. The trunks and leaves may be compared with those of coconut palms in the background of figure 3, upper left.

CHARACTERS OF THE INFLORESCENCE

Spathes broadly fusiform, in the old and dry condition, shown in figure 3, opening nearly flat, 64 cm. wide and of nearly the same length, the projecting tip about 15 cm., the surface closely plicate and deeply lamellose on the outside, smooth inside. Sections of the inner and outer surfaces shown natural size, in figure 6, the wall 1.5 cm. thick, probably nearly twice as thick in the fresh state; a pressed specimen of a lamella collected by Ekman is 2.5 cm. wide.

The axis is much thicker than the branches, even the upper part, with numerous female flowers at the base of the terminal portion, and these flowers much closer together than those on the branches, but ending with a sprig of male flowers, as on the branches. Many of the cocoid palms have the female flowers restricted to the lower branches, so that the terminal section of the axis is entirely male, as well as the upper branches and the ends of the lower branches. Where the female flowers are retained on the upper branches and on the axis, as in *Bornoa*, a gradual suppression of the branches would reach the stage of a simple inflorescence, as in many palms of the coconut family, and in several other groups. With palms that had restricted the female flowers to the lower branches, some of the branches might be suppressed, but not all.

In many palms the branches and the terminal portion of the axis are so completely assimilated in length and thickness as to be scarcely distinguishable. The thicker axis of *Bornoa* is in line with the fact that the inflorescence in this genus has been shortened rather than narrowed. In this respect *Bornoa* is in contrast with many of the related palms of the *Attalea* series and approximates the condition of *Elacis*. There



Fig. 6. Sections of spathe, inner and outer surfaces, natural size

the axis is greatly thickened as well as the branches shortened, and the female inflorescences are not provided with male flowers.

In many of the cocoid palms the branches may be described as pedicellate, since a narrower basal section is specialized that bears no flowers, notably on the lower branches of the coconut palm, where the naked basal space is several times as long as the spaces between the flowers. On this reckoning the branches of *Borhoa* are scarcely to be considered as pedicellate, since the lowest section, the joint bearing the first female flower, is scarcely longer than the other joints, and may even be shorter than some of them, as shown in figure 9.

The branches also show a strong tendency to being monostichous or unifacial, with all of the flowers on the outer or lower side, but distinctly irregular, often alternating or zigzag, especially among the short sections bearing the male flowers, with the contrast in thickness and length of joints as the most striking feature of these specialized branches.

The lower branches of the bisexual inflorescence are subtended by slender aciculate bracts 4 cm. long, gradually shorter on the upper branches; attaining 20 cm. in length, the lower female part 12 cm., with 9 to 11 flowers, the remainder a slender zigzag appendage with rather small and apparently imperfect male flowers.

FLORAL CHARACTERS

Normal male flowers with stiff spine-like petals, very small sepals, triangular, sharply carinate on the back. The stamens have a thick conical indurated base, for more than one-third of the length of the filament, the remainder slender and flexible. Stamens 9 to 11, two in front of petal, or three, the inner in front of the other two. The lower

male flowers of a branch have the sepals much larger than the upper, that is the lower are more like the female flowers, which have the calyx and corolla of nearly the same size and both broadly imbricate. The female sepals have firm indurated hooked tips, deeply excavate or boat-shaped. The sepals attain nearly 2 cm., the petals exceed 2 cm., with a robust spine-like mucro, on each side near the tip a sloping or projecting shoulder. Each of the female flowers is subtended by a large bract, especially on the lower branches, and each pair of male flowers has a projecting bract, giving a serrate appearance in the photographs, figures 8 and 9.

Female flowers with a low staminal cup; male flowers with three slender subulate staminodes, diverging at the tips, about half as long as the filaments. Petals of male flowers 7-8 mm. long, nearly 2 mm. wide at base, tapering from near the base to the thick hard spine-like apex. Female flowers nearly 2 cm. long, 1.5 cm. wide.

STRUCTURE OF THE NUT

The surface of the nut is nearly smooth and even, with slight longitudinal impressions of the mesocarp fibers. The shell is of fine compact structure, not incorporating the inner mesocarp fibers as in the related palms usually referred to *Attalea*, *Scheelea*, or *Orbigyna*. Although the surface has distinct longitudinal impressions of the mesocarp fibers, the section shows that they remain free. Figure 9.

A few fibers are found in cross-sections of the shell, in two somewhat parallel oblique rows at each of the intercarpellary sutures, thus indicating the sutural bands as structural elements of the wall of the nut. The bands are marked also on the surface of the nut, and often are prominent at the apex, so that some of the nuts are distinctly trituberculate, but one or two of the car-

pels also may be angled, so that 4 or 5 nearly equal prominences may be found. The sutural bands are shown in a similar manner in sections of the greatly thickened shell of a related palm from Guiana, probably the palm described by Aublet in French Guiana under the native name *maripa*.

The abortive carpels have a thin corneous operculum often depressed in the middle and eventually perforate by the center of the disk remaining attached to the substratum, that shrinks away somewhat obliquely. The depressions around the abortive carpels have sloping sides, while the rim of the fertile foramen is nearly flat. The short basal projection between the foramina is coarsely pitted with small cavities, but the fibers evanescent. Only one carpel is fertile. A single nut with four carpels was found, as shown in figure 9.

The large excavate foramina are in contrast with the very small superficial foramina of *Maximiliana regia*, where the opercula are flush with the surface, only the rims being slightly depressed. The opercula of the *maripa* palm are in slight depressions, but not surrounded by specialized sloping rims.

The apex of the *Borinoa* nut is much as in *Jubaea*, with a distinct pit between the more prominent angles of the sutural bands, the pit resulting from the loss of a small stigmatic plug of rather hard granular material, which falls out. The sutural bands of *Jubaea* are somewhat broader than those of *Borinoa*, though less distinctly marked in the cross-section. The walls of the *Borinoa* nut are somewhat thicker than those of *Jubaea*, with the flattened abortive carpels nearer to the inner surface.

NAMED FOR PRESIDENT BORNO

The genus *Borinoa* is named for President Louis Borno, in acknowledgment of his ready interest and prompt action, in 1927, in protecting

and preserving a series of experiments with rubber trees, *Hevea*, *Castilla*, *Funtumia*, *Manihot*, and *Mimusops*. The plantings were located at Bayeux, on the north coast of Haiti between Cape Haitien and Port de Paix, and were the only mature seed-bearing rubber trees in Haiti at that time.

The original plan of these experiments for testing the use of rubber trees for shading cacao and coffee plantations, was described in the Kew Bulletin of Miscellaneous Information 1910, page 208, by A. E. Casse, who left Kew in 1900 to take charge of plantations at Bayeux. Tapping experiments on the *Hevea* trees, conducted by the United States Department of Agriculture, are described in United States Department of Agriculture Technical Bulletin No. 65, "Experimental Tapping of *Hevea* Rubber Trees at Bayeux, Haiti, 1924-1925," by Loren G. Polhamus, published in 1928, and led to commercial rubber projects in Haiti and to experimental plantings of seed from these *Hevea* trees in southern Florida. The Florida experiments now have reached the stage of furnishing a local seed supply and producing rubber of good quality.

Mr. Borno, "distinguished among Haitians for his intelligence, culture and high character," was president of Haiti from 1922 to 1930, in the period of the "American occupation." Giving the genus a Haitian name may tend to local appreciation and interest in seeking out and preserving any natural growths that may still survive and in utilizing *Borinoa* as a cultivated palm. Not merely individual trees may be grown, in yards, gardens, and roadways, but large groves or acreages might well be planted. The kernels of the nuts are rich in oil and of finer texture and flavor than those of many South American palms that are being utilized for the production of oil, similar to the oil of



Fig. 7. *Branches of female inflorescence, natural size*



Fig. 8. *Branches of male inflorescence, natural size*

the coconut palm.

The nuts of *Borhoa* are smoother and cleaner than most of the commercial palm nuts, without the closely adherent fibers that in many cases interfere with the separation from the husks, and the shells are thinner, so that extraction of the kernels by machinery would be easier and involve less breakage. Hence it seems reasonable to expect that *Borhoa* might attain a commercial status if the nuts were available in quantity, and that this native palm may prove superior to the coconut as the basis of a local oil industry. Differences in productiveness or in other characters that could be utilized through selection doubtless would be found if the palms were grown in quantity.

BORHOA DISTINCT FROM MAXIMILIANA

Borhoa has been confused with *Maximiliana* and *Attalea* but apparently is widely different from the type species of these genera. It differs from *Maximiliana regia* Martius, in the clean columnar trunk, compact foliage, regular adjacent pinnae, crassate spathes, suppressed peduncle, large indurated spiniform male petals, contorted stamens, oval obtuse endocarp and large excavate basal foramina.

The trunk of *Maximiliana* usually is roughened with the persistent erect leaf-bases, the pinnae are in compact groups, with the groups well separated along the rachis, the spathes and spadix distinctly pedunculate, the male petals minute like the sepals, the stamens rigid and straight, the endocarp fusiform with minute superficial foramina, the sutural sclerites prominent at the apex.

The stamens are enlarged and indurated in the Brazilian palm, while the petals are thickened and indurated in *Borhoa*, as shown in figures 9 and 10. An example of long rod-like stamens, several times as long as the petals, is

given at the left of figure 11, representing *Maximiliana caribaea* Grisebach and Wendland, a species that grows in Trinidad, from a specimen in the United States National Herbarium.

The following graphic description of the Brazilian palm by Alfred Russell Wallace, in "Palm Trees of the Amazon and Their Uses," shows that the leaf and fruit characters are very different from those of *Borhoa*.

"This palm has a lofty massive stem, smooth and obscurely ringed. The leaves are very large, terminal and pinnate. The leaflets are arranged in groups of three, four or five, at intervals along the midrib, from which they stand out in different directions, and are very long and drooping. The bases of the petioles are persistent a short distance down the stem, and sometimes down to the ground, even when the trees are forty or fifty feet high.

"The spadices are numerous, growing from the bases of the lower leaves. They are simply branched and very densely clustered. The spathes are large, spindle-shaped, ventricose and woody, with a long beak. The fruits are elongate and beaked, with a tough, brown, outer skin, beneath which is a layer of soft fleshy pulp of an agreeable subacid flavour, covering a hard stony seed.

"The leaves of this tree are truly gigantic. I have measured specimens which have been cut by the Indians fifty feet long, and these did not contain the entire petiole, nor were they of the largest size. Owing, however, to the loose irregular distribution of the leaflets, they do not produce such an effect of great size as those of the Jupati, which are more regular. The great woody spathes are used by hunters to cook meat in, as with water in them they stand the fire well. They are also used as baskets for carrying earth, and sometimes for cradles."

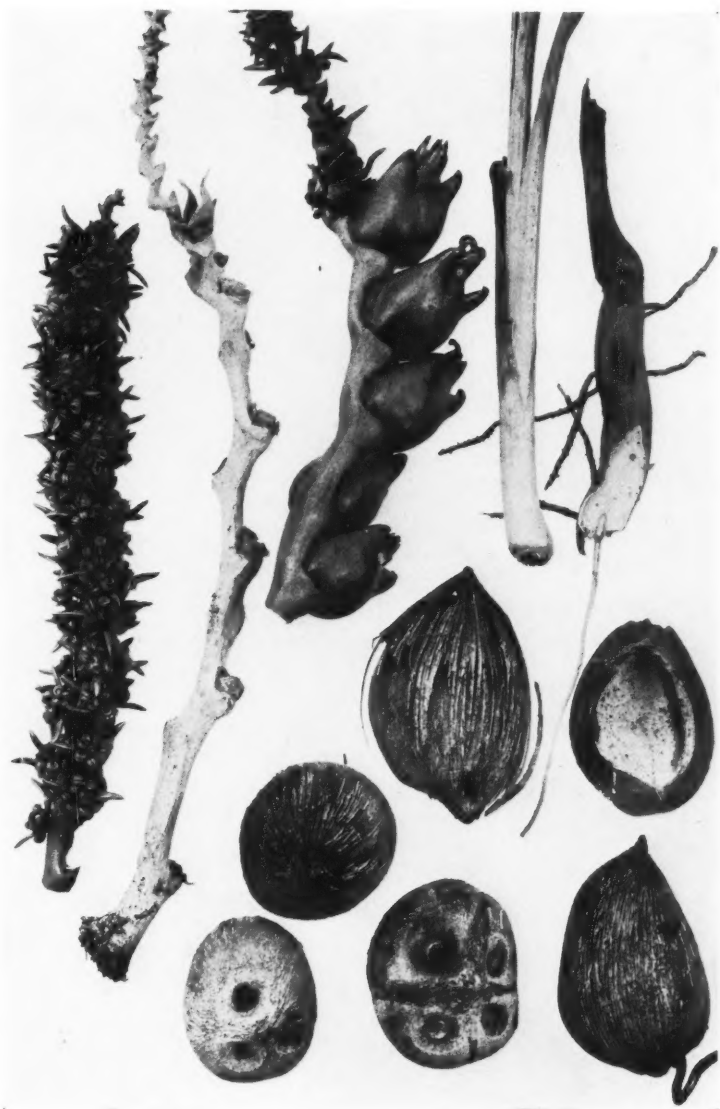


Fig. 9. *Flowers, seeds, and seedling, natural size*



Fig. 10. *Male flowers with coiled stamens, enlarged*



Fig. 11. *Flowers of Maximiliana, germination of Bornoa*

The original illustrations of *Maximiliana regia* are confusing on account of the nut of another palm being substituted, a nut rather similar to that of *Borhoa*, broadly oval with basal foramina, identified by Herr Burret as *Orbignya agrestis*. Martius seems to have corrected this error in the *Palmetum Orbignianum*, plate 31, showing a fusiform fruit with a small perianth and a narrowly fusiform nut tapering at both ends, but more abruptly in the lower part, and the foramina farther above the base than in *Borhoa*.

The name *Maximiliana* being preoccupied and the substitute *Englerophoenix* proposed by Otto Kuntze not being acceptable, the name *Tecenia* is suggested, referring to the special dedication of this palm by Martius to his royal patron, Maximilian. Under this designation the name of the type species would be *Tecenia regia* (Martius).

DISTINCT FROM ATTALEA

Many of the palms formerly classified under *Attalea* are now being referred to *Orbignya* or to *Scheelea*. The type species, *Attalea amygdalina*, described from Colombia by Humboldt, Bonpland, and Kunth in 1815, may be closer to *Borhoa* than to the other genera, but presents many differences. It is a small palm, 6 to 12 feet tall, with a very short trunk, possibly creeping or burrowing, the inflorescences emerging from below the surface, the spathe 4 feet long, sulcate-striate; the branches flexuous and compressed, with unilateral flowers inserted in pairs, a single male with a single female, and a large broadly oval thick-shelled three-chambered nut, two to three inches long.

It appears from the plates that the branches have only a single female flower, on a rather long robust basal joint, and that the male flowers are sin-

gle and well separated, the male sections of the branches not being reduced to small zigzag rudiments as in *Borhoa*.

The male petals are described as ovate lanceolate, acute, fleshy, striate, concave, subequal, and appear in the figures as enclosing and notably exceeding the stamens, instead of the indurated open corolla of *Borhoa*. Some of the flowers have four petals. The stamens are numerous, 18 or 22, with narrowly linear-subulate anthers 5 or 6 times as long as the narrow filament.

The female flowers are said to have the calyx, meaning the corolla, as in the male flowers, doubtless referring to the ovate-triangular form of the petals, shown in the drawings much larger than the male petals, and relatively wider. The style is thick and short, with long strongly reflexed stigmas.

The fruit is described and figured as a fibrous drupe, with three equally developed carpels, a short apical projection, the surface of the nut as longitudinally sulcate, the three large foramina very close together, and the narrow intercarpellary sutures marked by deep narrow grooves meeting between the foramina. There is no indication of a basal prominence or of porous bands on the sutures between the foramina, as in *Borhoa*. The specific name *amygdalina* and the native name *palma almendron* apparently refer to the edible kernels rather than to the flesh of the fruit, or to its external appearance.

DISTINCT FROM ORBIGNYA

The genus *Orbignya* originally was based on an outstanding type from Bolivia, *Orbignya phalerata*, described and figured in the *Palmetum Orbignium*, p. 125, 1847, with very large fruits, attaining the size of small coconuts, 5 inches long and more than 3½ inches wide, with 5 to 7 carpels, the largest number of any of the cocoid palms, and pro-

tected by the strongest of walls, more than half an inch thick, equal to the diameter of the chambers.

The palm has a slender smooth columnar trunk with a narrow crown of large upright or strongly ascending evenly pinnate leaves, 20 to 24 feet long. The corolla of the male flower is irregular, with broadly ensiform unevenly divided or supernumerary petals, apparently rather thick, but flat rather than cornute. The stamens are described and figured with the anther cells not adnate but separately coiled on opposite sides of the filament. The female inflorescence has the branches restricted to a single flower, with a very short and slender male appendage.

The name *Orbignya* being unfortunately preoccupied, *Heptantra* is suggested as a substitute, in reference to the 7-chambered nut, although species with fewer carpels might belong to the genus. The type species, as above, is *Heptantra phalerata* (Martius).

ALTERNATIVE NAMES OF PALMS

Methods developed in the care of herbarium collections may not be equally adapted to other lines of botanical interest. For the herbarium worker it seems of the first importance to establish for each plant an accepted, authoritative name, to use on the labels of the plants, any alternative names only causing confusion in filing the pressed specimens. Collecting and naming plants is an interesting occupation, but is only the beginning of botanical science. One of the principal uses of plant names is to give us access to botanical literature, the great body of knowledge relating to the plant world. For these wider historical and biological purposes alternative names of plants are not to be dispensed with, but remain in use indefinitely.

Botanical study may be discouraged or impeded by placing too much em-

phasis on the idea that names may be fixed by authority. Continued study of classification sometimes is deplored or even resented, from the notion that sudden and confusing changes of names are necessitated by each revision. Some of the zealous efforts to keep the names "up-to-date" are based on a partial understanding of the problem of classification. As soon as a different taxonomic arrangement is suggested, even long-current names may be ruled out as "incorrect," in order to restrict usage at once to the changed designation. Needless confusion from repeated generic transfers may be caused by premature efforts to force immediate changes of popular usage.

Most of the palms, for example, that have been named during the last century as species of *Cocos* or *Attalea* are likely to be placed eventually in other genera, but characters for distinguishing the genera must be worked out and formulated and time limits are not to be set for the critical work that is needed. Continued use of these familiar names in their older, wider applications, for general reference purposes, is clearly advisable, until technical usage of other names is somewhat stabilized.

Many problems of taxonomy call for continued study and suspended judgment in critical cases, especially among the palms where knowledge often is fragmentary. Compared with other groups, very little material has been collected, the palm order as a whole being very poorly adapted to herbarium treatment. Palm nomenclature is complicated also by the fact that the two principal authorities, Martius and Baccari, were notably arbitrary in applying names.

The name *Maximiliana*, for example, proposed by Martius in 1824 for a Brazilian palm, had been used by Martius himself in 1819, for the tree later



Fig. 12. Juvenile leaves and root system of *Bornoa*

ENGELMANNIA Pfeiff.: *Cuscuta*
suaveolens Pfeiff.

Bot. Zeit. iv. t. 1, fig. 1-8 (1846).

ENGLERASTRUM Briq.

Schweinfurthii Briq.

Engl. Jahrb. xix. t. 3, fig. A (1894).

ENGLERIA O. Hoffm.—Vide *Adenogonum*

africana O. Hoffm.

Engl. Jahrb. x. t. 9 (1888).

Pflanzenfam. iv. v. 147 (1890).—*Fr.*

Engler & Drude, Veget. Erde, ix. 1. 2, p. 561
(1910).

— **radiata** Oliv.

Hook. Ic. Pl. xxiii. t. 2205 (1892).

ENGLEROCHARIS Muschler

peruviana Muschler

Engler & Drude, Veget. Erde, xii. 198 (1911).

ENGLERODAPHNE Gilg

leiosiphon Gilg

Engl. Jahrb. xviii. 504 (1894).

Pflanzenfam. iii. vi. A. 231 (1894).

ENGLERODENDRON Harms.

usambarensis Harms.

Engl. Jahrb. xl. 29 (1907).

Engler & Drude, Veget. Erde, ix. 1. 1, p. 310 (1910);
ix. iii. 1, p. 467 (1915).

ENGLERODOXA Hörold

alata Hörold

Engl. Jahrb. xlii. 266 (1909).—*Fl.*

ENGLEROPHOENIX O. Kuntze: *Maximiliana*

attaleoides Barb. Rodr.

*Barbosa Rodrigues, Sert. Palm. Bras. i. t. 60
(1903).

longirostrata Barb. Rodr.

*Barbosa Rodrigues, Sert. Palm. Bras. i. t. 60
(1903).

ENGLEROPHYTUM K. Krause

stelechantha K. Krause

Engl. Jahrb. l. Suppl. 345 (1914).

ENHALUS = *Enalus*

Fig. 13. *Engler names in Index Londinensis*

known as *Cochlospermum*. Some might argue that an author should be allowed to withdraw a name that he has proposed, and apply it to a different genus, or that Martius, at least, should rate such a privilege, in view of his unique contributions to botanical science, not only in the palm group, but in the general fields of classification, ethnology, and philology.

Whether Martius merely forgot the other tree, or consciously undertook to transfer the name, does not appear, but he was impressed by the palm as the most graceful and imposing tree of the entire Brazilian flora, and he mentions also the illustration of the palm, which he had painted from nature in Brazil, as the special ornament of his monumental work, thus including the painting and the book in the dedication of this outstanding palm to his royal patron, Maximilian Joseph, King of Bavaria, as an act of grateful homage "*in Regem optimum*." Certainly nobody would wish to remove such a memorial of gratitude and friendship, or to see it appropriated casually for the fame of Engler or another. A name like *Englerophoenix* must always seem out of taste and out of place, like a ravaged tombstone.

If the law against homonyms must be enforced at any cost of sentiment, a name should be available which is not absurd or offensive, or in conflict with the purpose of Martius to appreciate and commemorate his royal friend. The name *Temenia* is suggested as such an alternative, to signify that the palm had been set aside for a venerable purpose, as a tree to be planted in a sacred grove, according to Greek custom.

Apart from taste or sentiment, two good rules or practices are offended by such a name as *Englerophoenix*, the rule that Linnaeus observed against the compounding of generic names, and the rule against naming more than one plant for the same person. No purpose is served in disregarding such counsels, except to avoid the labor of finding distinctive terms that are not preoccupied.

The reference to *Phoenix* is gratuitously confusing and misleading to every beginning student or general reader, involving a palm of another continent and no botanical relationship. There was no occasion to muddle at this point, since *Engleropalma* might have been used if a second thought had been indulged.

The lengths of absurdity to which personal duplications may be carried is seen in the series of Engler names in the Index Londonensis, reproduced in Figure 13, and even this assemblage is not complete, lacking ENGLER-ELLA and ENGLERINA, or possibly others that may not have been collected from current publications. The association of a single plant with an eminent person who may have contributed something to the progress of science is not a burdensome tribute, but the many Engler compounds lose any mnemonic value, becoming merely jargon.

Why should science assume unnecessary handicaps by using distasteful, confusing, misleading names? Botany is a branch of science, and science arose as a branch of literature, the art of verbal expression, in the service of clear understanding. In science, as in art, taste and interest are inseparable elements.



Joseph B. Gable

Left, *Rhododendron mucronulatum* × *R. spinulosum*. Right, *R. Degonianum*

Rhododendron Notes

CLEMENT GRAY BOWERS, *Chairman*

A correspondent on the West Coast brings up a question that is so universal among rhododendron growers as to merit a bit of attention. "The south of England," he writes, "has experienced one of the most severe winters in recent years. The casualties have been great and have extended over a wide area. As these have been reported from time to time, they have upset many standard ratings for hardiness. Some so-called tender plants have survived in splendid shape, while others thought to be thoroughly hardy have been cut to the ground. This is a common experience to many of us. . . . Next, there are a number of cases reported of plants of like size and variety in the same location, some of which survived while

others were killed. . . . I can readily conceive of different inherited qualities or new breaks in individual seedlings, but what would be the answer on 'layers' of the same plant? . . . Again, similar results occurred when one plant in shade weathered the winter nicely and a companion in sun was cut down by the first heavy frost. . . . Can this thing be measured, and what is the protecting quality of shade: is it dampness or lack of sunlight, or both? . . . Plants have a tolerance to a range of climatic conditions. . . . Independent of breeding, can not this tolerance be extended considerably once we acquire a fundamental knowledge of the things that advance or retard it?"

Regardless of England, it is safe to

say that nearly all American growers who have experimented with more than the commonest species have encountered such results as these and have speculated about the causes. Some have found the answer, so far as their own special limitations are concerned, but what obtains in one environment will differ elsewhere, so that it would take a whole series of special studies by a plant physiologist, covering a large number of types of cases, to obtain a comprehensive answer, I believe. At present, one just may not be dogmatic about it, because so many factors are involved that "rules of thumb" and simple explanations are usually both inadequate and inaccurate. I suspect this statement may be challenged by some growers who feel that they have found the answer. Occasionally some primary cause can be easily located, but the prevailing sin of the average gardener is to take for granted some simple explanation of complicated natural phenomena where complex inter-relations may be involved. It is surprising, for instance, to discover how many persons attribute success or failure in rhododendron growing to soil acidity alone. Granted that this is one of the more important factors, there are, nevertheless, a dozen other considerations that, individually or collectively, might be equally important.

It seems probable that each species of rhododendron does have a definite range of adaptability and that in this country there is a belt, zone or area within which it will succeed and outside of which it will probably fail. Along the borders of any such zone may be found varying sites or regions of precarious character, where the culture of the species is hazardous. This is a sort of Mason and Dixon line, and, if the zone happens to be a very narrow one, the entire area may at times become a part of this boundary line as variations

in the weather occur. A great many of our rhododendrons in cultivation will be found to be growing practically on this boundary line, especially if situated in localities where extremes of heat, cold or drought may occur. In such a situation trivial things, which might be unimportant elsewhere, may result in winter injury. In these United States, where most of us do not have the Utopian horticultural conditions of England, such factors cause much grief to gardeners who covet the finest new rhododendrons.

To examine the evidence, let us take the first case cited: plants of the same species and size, growing in the same location, some of which survived while others were killed. Here, the first factor to consider is the inherent nature of the individual itself. A species is not a hard and fast thing, but a whole population of individuals, differing somewhat from one another, just as people within a race will differ from one another. The same thing is true, in lesser measure, within a botanical variety or, in fact, among any group of plants propagated from seed, for every seedling is a separate individual and subject to the varying degrees of strength or weakness, vigor or susceptibility which characterizes any separate individual. In rhododendrons, this factor is of considerable importance, for they are mainly quite variable and it is not surprising that differences in hardiness exist as well as the more obvious differences in other features. It sometimes takes an unusually cold winter to uncover these weaklings, but that they are frequently present is clearly apparent. Of course, the practical application to be drawn in this case is to discover the hardy individuals, preserve or intensify this quality of hardiness in subsequent generations by breeding only from hardy stock, and to eliminate the tender individuals—which Nature

usually does without help from the gardener.

When, however, we are dealing with a clonal variety—which term indicates a sort that has been grafted, layered or otherwise propagated from a common individual by some vegetative means and not by seed—we are no longer encountering a population of differing individuals, but one single plant which has been multiplied by grafting. Here, obviously, there is but little chance for genetical variation, so when inconsistent results do occur one has to look for the cause in something else beside the tissues of the variety. The first place to look is to the grafting stock. Assuming that this is entirely hardy material, there is still a certain amount of anatomical variation, since seedling stock is generally employed and the plants used for grafting stock are far from uniform. This, and other factors, such as may occur in the process of grafting, may result in unequal graft unions, either good or poor as the case may be. This, in turn, may have a fundamental effect upon the thrift and hardiness of the grafted plant—an effect that might not appear until the advent of severe weather conditions. Then, too, one grafted plant may develop its own roots above the point of union, thus giving it an advantage over the one which has not done so; and this root development may be the result of deeper planting, a heavier mulch, the position of the graft union, the nature of the scion or any one of an almost unlimited number of seemingly minor details. There is no need for going further into the matter, since this illustrates the many ramifications that may develop from any query into hardiness.

Nor shall I delve deeply into any other groups of things which may be called environmental causes of variation in hardiness. Almost anything that may have prevented vigorous

growth during the preceding summer can be called a factor in causing winter injury, since it is now a fairly well established belief that unthriftness during the growing season predisposes a rhododendron to winter injury during the subsequent season. Drought, poor graft unions, mechanical injury, improper soil acidity, poor nutrition, insect attacks, disease, improper physical condition of the soil and possibly other things may, by this token, be regarded as indirect factors influencing the survival of rhododendrons under severe winter conditions. To these we may add the direct influences of site and exposure, the amount of shelter given, the temperature throughout the year, the severity of winter cold, the suddenness and duration of cold waves and the water relations of plant and soil at all times. In addition to these and other known factors, I feel that there may be some other important items in rhododendron ecology still undiscovered.

When layered offspring of the same plant, comparable in size and other features, behave differently, we are quite definitely away from genetical explanation. Being on their own roots, we have no grafting stock to blame. Here the problem is unmistakably a physiological one, and as such it is susceptible to explanation upon some of the bases mentioned in the preceding paragraph. Most fundamental, perhaps, are water relations. Fundamental, also, is the chemical composition and concentration of the solution within the plant cells in winter. Elaborate series of inter-reactions govern such things. Physiological investigations are from time to time adding cumulative bits of evidence to our body of knowledge concerning these processes. It is not my intention to discuss these technicalities here. Suffice it to say that there is still a lot left to learn.

For practical purposes, it is often difficult to measure such things as these, mainly because so many different factors work together to bring about the results. It isn't impossible to measure the temperature, the atmospheric moisture, the sunlight and other obvious things—and in some instances we may get an answer from such data—but generally we cannot attribute our results to any such causes. Happily, we can, in many cases, find a solution to our problem, if not an answer to the question, by the old, time-honored "cut and try" method. Simply try lots of things and observe results closely, noting what happens and guarding against false interpretations. One ounce of careful experimentation is worth a ton of theory. The only trouble in such problems as these is that the limiting factor in one man's garden is apt to be a totally different thing from what it is elsewhere, so the results are frequently useful only locally. And in nine times out of ten, the fellow who has discovered the answer to his own problem concludes that he has discovered a universal solution—and thus another fallacy is born! Scientists as well as amateur gardeners sometimes fall into this same error.

Nearly all that has been written here is applicable to other woody plants beside rhododendrons and azaleas, but in ericaceous plants, and in rhododendrons particularly, the matter of ecological conditions is greatly magnified, due to the peculiarities of the genus. When you survey the whole group of rhododendrons you will note that the majority of the species, as they grow wild, occur in habitats that are distinctly queer and peculiar as compared with the conditions in any ordinary American garden. This is emphatically true of the sorts that come from the Himalayas, Tibet, the tropics, the alpine regions and the arctic. Occasionally one

of these exotics will surprise us by thriving in our garden, and this adds zest to our work, but it is not surprising to find that most of them are strictly delimited in adaptability. We must look to hybridization, and this, too, within a rather limited scope, if we are to do much with these new species in America. That and the discovery of their special requirements seems to be necessary if we are to combat the hot summers and cold winters of the eastern United States. The natural habitat of these exotics suggests that they may not thrive, except within a rather narrow range of conditions. English gardens and those in certain specially favored parts of America seem to be mild enough to accommodate them, but our country in general requires plants of fairly wide adaptability if they are ever to become popular dooryard favorites. I firmly believe that we are destined to see great developments of plants within the genus *Rhododendron* for American conditions, but I am equally firm in my belief that our climate demands that we work out our own problems and not ape other growers who are blessed with conditions which are almost ideal when compared with ours. C. G. B.

Rhododendron Hybrids Hardy in Vermont

Dr. Wilson's appeal in his books for someone to raise Smirnowii Hybrids captured my imagination.

Writing him for advice and seeds brought an interesting letter with the seeds of fifteen species of *Rhododendrons* and his good wishes.

SPECIES

Smirnowii, *Yedoense*, *Schlippenbachii*, *maximum*, *Kaempferi*, *japonicum*, *carolinianum*, *nudiflorum*, *arborescens*, *mucronulatum*, *roseum*, *calendulaceum*, *Vaseyi*, *luteum*, *minus*.

I obtained from Bobbink and Atkins

Caractacus, Charles Dickens and Atrosanguinea. These did not prove hardy with me.

Luteum and *Kaempferi* were too tender and *minus* too insignificant for garden use.

Japonicum, *calendulaceum*, *Schlippenbachii*, *Yedoense*, *mucronulatum*, *maximum*, *roseum*, *nudiflorum*, *Vaseyi*, *arborescens* and *Smirnowii* were all hardy in wood. *Mucronulatum* is caught by late spring frosts and *Schlippenbachii* and *Yedoense* have their buds winter killed about half the time.

I would rate the Azaleas for Vermont garden use as follows:

1. *Vaseyi*, loveliest and most dependable, a rapid grower.

2. *Calendulaceum*, best of the flame azaleas.

3. *Japonicum*, good bush and interesting flowers, a rapid grower.

4. *Arborescens*, good bush, lovely flowers.

5. *Schlippenbachii*, perfect bush, lovely large clear pink blooms but not dependable for bloom. Slow to begin flowering.

6. *Roseum*, good.

7. *Nudiflorum*, good.

8. *Yedoense*, least desirable of all.

Of the rhododendrons with evergreen leaves, *Smirnowii* interested me most. *Carolinianum* makes a symmetrical bush and usually flowers freely.

Starting with two hundred (200) seedlings of *Smirnowii*, I discarded the poor growers and carried on one hundred seedlings. Of these, twenty-one proved to be hybrids, of which fifteen had a desirable habit of growth.

I have selected four of these, which seem good garden subjects, for propagation.

The two best will be named—

No. 1. "DR. CARL GOODWIN BURDICK." It is a handsome bush, with large, thick, leathery foliage. The leaves are smooth on top and under-

neath. The truss carries fifteen large, attractive, ruffled flowers on strong stems and well placed. The color is sprightly light rose pink with heavy yellow spotting.

No. 2. "PICO." A strong plant. Foliage like *Smirnowii* species, dark green, with heavy light tan indumentum. It is a more upright grower than *Smirnowii* itself, has fewer lateral leaf veins and carries a larger, fuller truss of nineteen ruffled flowers. The jowlers are 3 1/3 inches in diameter, with strong stems giving style and snap to the truss. The general exact is orchid pink with yellow spotting.

Seedlings raised at "Camp Free," 1,100 ft. altitude.

MARY E. G. FREEBORN.

R. mucronulatum × *R. ambiguum*

Among rhododendrons hardy along the Atlantic seaboard those with yellow flowers are quite a desideratum of gardeners who make this class of plants their hobby. Therefore hybrids of yellow flowered species with hardier sorts of all colors have been concocted in the hope of obtaining a hardy yellow hybrid.

The subject of these notes is just another failure when considered from the point of view of that objective—which is not surprising to the plantsman who has seen *R. ambiguum* in flower, its pale greenish yellow blossoms blending so nearly with the color of its new growth as to be scarcely distinguishable. The rose purple of *R. mucronulatum* is overwhelmingly ascendent with only the faintest yellow shadings in the throat of the flower as evidence of its other parent.

From *R. ambiguum* however its fine pointed evergreen foliage is inherent and so we might well describe our hybrid as an evergreen *R. mucronulatum* opening its slightly paler flowers a little later than that species and so escap-

ing late spring frosts with a little more regularity. Only one seedling of this mating was raised here and since it is sterile, propagation by cuttings must be resorted to for its increase.

R. mucronulatum × *R. spinuliferum*

The great hardiness and vigor of growth that characterize *mucronulatum* crosses as a class are not so conspicuous in this plant. It is fairly immune to winter cold but seems especially susceptible to other rather indefinite indispositions that adversely affect its general well being. Some seedlings have proven better than others in this respect but none are of really vigorous habit.

The ancestors of *R. spinulosum*, the pollen parent are, as the initiated, I suppose, should infer from its name, *R. spinuliferum* and *R. racemosum*, the first having upright tubular brick red flowers while those of the second are rose pink to nearly white. This hybrid, *R. spinulosum*, originating in Kew Gardens, inherits too many tender traits from *R. spinuliferum* to be growable in the open with us, but its cross with *R. mucronulatum* with which these notes are concerned succeeds well outdoors and produces purplish pink blossoms that have a poise that is "different." With me at least it is this airy graceful appearance when in bloom that redeems this otherwise very ordinary looking plant. It is but partially evergreen.

R. orbiculare × *R. Williamsianum*

Raised from seeds sent me by Mr. E. J. P. Magor, Esq., an English gentleman who has done much work with the genus rhododendron, when I sent him a photograph of the first plant to flower for me he replied that he did not now possess this hybrid and had no recollection of having made the cross! Which leads us to realize what a wealth of fine garden rhododendrons must be available in Cornwall that such a lovely thing as this should be allowed to pass

unnoticed by its originator.

Added to its superlative plant habit, medium dwarf stature and excellently disposed foliage, the pale pink flowers huge for the size of the plant, pendant on rather long pedicels in clusters of three to five, paint a picture that gardeners in our part of the world would give much to possess.

It seems to miss that desirable—nay necessary—attribute, hardiness, by only a narrow margin as plants on a north wooded slope have survived several seasons with little or no injury but others more exposed look very badly this winter. In protected situations nearer the coast I think it should prosper and there are good reports of its behavior in the Pacific Northwest.

R. Degronianum

This is the name by which our plant savants inform us we must now call the rhododendron, long known in garden literature—but very rarely in our gardens—as *R. Metternichii*, the true *R. Metternichii*, differing in its deeper pink, more heavily spotted, sevenlobed corolla, being a species as yet doubtfully in cultivation.

R. Degronianum is hardy though slow growing being inclined to be rather dwarf in habit and its pure pink five-lobed flowers, only occasionally spotted deeper in the throat, are of fair size—compared to the plant and foliage—very fair sized.

The color is good in all plants that I have seen in flower and the only reason that this fine species is so much too seldom seen in our plantings is, it is surmised, that nurserymen find the true thing so very hard to come by that they do not in general offer it to the gardening public. True, it has been offered and, as I happen to know personally, in good faith, but somewhere between ninety and one hundred per cent of the plants so sent out have been untrue to name.

JOSEPH B. GABLE.

Rock Garden Notes

ROBERT MONCURE, *Chairman*

Dwarf Tulips in Manitoba

Where the delightful crocus can be enjoyed only by patient coaxing some of the little known dwarf tulip species will be found to take their place thriving well and forming a very interesting study in themselves. With the exception of *Crocus alata*, no species of crocus has been found reliably hardy at Dropmore so far. This species though quite hardy increases very slowly with us. It is therefore with a keener interest that those of us who delight in the first flowers of spring turn to the early flowering dwarf tulip species, several of which resemble the crocus in their growth.

Tulipa polychroma Stapf is quite dwarf. The flowers are white, with a cream or yellow centre, the back of the outer segments being stained pink, which deepens and spreads as the flowers age. It is a native of Persia, Afghanistan and adjacent districts of Central Asia. This species ripens seeds freely with us and the seeds germinate readily if sown soon after ripening. A gritty soil in a well drained site seems to suit the tulip species and of course they all delight in a place in the sun.

Tulipa linifolia Regel and *T. Batalini* also of Regel are two gems among the dwarf tulips. The former has brilliant crimson flowers with a blue base, while

the latter has exquisite cups of pale cream. In nature they extend from northern India to southern Siberia and are said to reach an elevation of 11,000 feet in Chitral. Though both are hardy at Dropmore, neither have so far produced seed, and they increase very, very slowly from the bulb.

Tulipa biflora Pallas is the earliest species to flower at Dropmore. The white flowers with yellow base come from 3 to 7 one on a stem and the narrow petals give them quite a starry effect. It is not quite as showy as any of the preceding species mentioned. It is native of the Volga region of southern Russia.

Tulipa turkestanica Regel is closely allied to and resembles in many respects *T. biflora*. It is, however, a little later in flowering and the flowers, 3 to 7 on a stem, seem to be of more substance and therefore somewhat showier. It ranges throughout Turkestan and south central Siberia and like *T. biflora* grows readily from fresh seed. Seeds are usually freely produced with us.

A number of other species of tulips from Central Asia are flourishing at Dropmore, growing readily from seed. Most of them that have flowered, however, are a little on the tall side for the purpose mentioned.

F. L. SKINNER.

A Book or Two

Manual of Pteridology. Edited by F. Verdoorn. Pp. i-xiv, 640, with 121 illustrations. The Hague, M. Nijhoff. 1938.

As the title indicates, this work is a comprehensive survey of the ferns and closely related groups, past and present. The subject matter is presented in the form of 23 topical essays, about equally in English and German, prepared by specialists in their respective fields. The volume is not intended to be monographic, and purposely does not cover all existing literature. Nevertheless it summarizes established knowledge of the widest scope, and the extensive bibliographies and copious references to literature throughout will be of great value, especially to the taxonomist, for whose benefit primarily, but far from exclusively, the work was planned. Of particular interest to him are the chapters on morphology, anatomy (with a good treatment of stellar structure), experimental morphology, and the Filicinae, as partially reclassified by Christensen. Similarly of interest mainly to the scientist are the chapters on cytology, caryology, and chemistry. Throughout the volume, the mass of detail information is too vast for brief summary.

Some of the chapters are of more general interest, especially to horticulturists; for example, one on the ecology of extratropical pteridophytes, which discusses the influence of moisture and temperature on growth and distribution. Ferns occur in almost all places capable of supporting plant life, but are comparatively few in arid regions. Most ferns and fern allies prefer an acid soil, notably the Ophioglossaceae, Osmundaceae, Isoetaceae, Equisetaceae, Lycopodiaceae, and Schizaea-

ceae; but others, such as many species of *Adiantum* and *Cheilanthes*, prefer a basic substratum. However, within a given genus the species vary in their soil requirements, and the horticulturist will have to determine for each its special needs, preferably by study of plants in the wild. The chapter on the ecology of tropical pteridophytes discusses interestingly the various influences affecting distribution.

According to Winkler, in the chapter on Geography, the percentage of endemism in ferns is high, e.g., in Madagascar 46 per cent (*Selaginella* 70 per cent), in New Guinea 60 per cent (*Selaginella* 80 per cent). Endemics are of two types: "old endemics," or "relict species," presumably once of wider range (e.g., *Dipteris*, *Loxsoma*, *Thyrsopteris*), and "young endemics," species too recent to have had time for wide dispersal, e.g., *Elaphoglossum* in the Andes, *Doryopteris* in Brazil. Endemism is particularly marked among the tree-ferns (Cyatheaceae). So-called cosmopolitan ferns are few in number, and some of these are doubtless collective species. In the North, circumpolar species are relatively numerous; in the Antarctic they are few. A table showing the distribution of all fern genera is given.

In the chapter on genetics it is indicated that comparatively little is known as yet concerning heredity in ferns, although Mendelian segregation is in principle the same as that in the flowering plants, and in spite of the fact that cristate, divided, and variegated forms offer a most promising field for investigation. Many fern hybrids have been described, but in most cases hybridity has been assumed, not actually demonstrated. The somatic mutations of the Boston fern are discussed.

Other chapters of interest deal with such subjects as the effect of light, gravity, hormones, and chemical compounds on the growth of ferns; the development of adventitious buds and roots; diseases of greenhouse ferns; ferns as host-plants for crop-plant parasites symbiosis; and mycoerhiza (root fungi). In general, the presentation of data is clear and precise. Mechanically, the volume is excellent. More than a few errors of spelling are noted, however, and at least two ferns are illustrated under wrong names; viz, *Notholaena sinuata* (p. 387) is incorrectly labeled *N. Fendleri*, which it does not remotely resemble, and the figure on p. 385 certainly represents some species of *Cyclophorus* other than *C. lingua*. Errors of this sort will be corrected, of course, in later editions.

The present work is an exceedingly valuable, stimulating compendium of information covering the whole field of pteridology. Sincere gratitude is due its originator, Dr. Verdoorn, for having carried the project through to successful conclusion.

W. R. M.

Conspicuous California Plants. By Ralph D. Cornell. San Pasqual Press, Pasadena, California, 1938. \$4.00.

This book is an excellent running commentary on a few of the prominent native California plants, principally trees and shrubs, without eschewing the popular style of some gardening books. The format, photographs and subject matter harmonize exceptionally well, as do also the sympathetic drawings by Elizabeth Lewis. Such plants and trees as the Torrey Pine, Monterey Cypress, *Yucca whipplei* (Candles of God), *Ceanothus* or wild lilac, Coffee Berry or *Cascara sagrada*, *Arbutus Menziesii*, Sequoias, California slippery elm or *Fremontia* and various

Manzanitas or *Arctostaphylos* are discussed, with a background of plant lore, botanical history and their economic value and use, especially their use by early settlers and Indians. Two indexes are provided; one of popular names and the other of botanical names, very helpful aids in a book of this character. Additionally notes on the garden uses of the various plants are conveniently compiled. Clearly this book was a labor of love for the author.

R. M. C.

Flowering Shrubs of California. Lester Rowntree. Stanford University Press, Stanford University, California. 306 pages, Illustrated.

Mrs. Rowntree is well known to the readers of this journal, to which she has lent her devotion and knowledge. We have read enviously, perhaps, of her expeditions into all the places, away from man and his centers of activity.

The present volume deals only with the native flowering shrubs of California and gives major attention to two genera, *Ceanothus* and *Arctostaphylos* with more generalized attention to other plants which are grouped ecologically or in small family associations.

The presentation is vivid and alive touched with real gusto and a fine sense of pleasure in nature and tempered with fruits of experience. Whether one ever hoped to grow a *ceanothus* or not he could read the book with pleasure. The portions and scattered opinions related to garden activities seem sound and certainly are temperate.

America's Garden Book. Louise and James Bush-Brown. Charles Scribner's Sons, New York, 1939. 1222 pages, illustrated, \$3.50.

This, as you see, is a fat book. It weighs almost as much if not quite as one volume of Bailey's *Cyclopedia*. So far it lives up to its title. The end pa-

pers give a map of "Zones of Hardiness" but that is just about as far as the book goes for any place except the usual Atlantic Coast States. It is really lamentable that this excellent work should be handicapped by so inaccurate and pompous a title.

The factor which lifts this book above all its fellows, as far as this reviewer knows, is the very high level of taste that characterizes all its proposals. This more than compensates for title, the serious omissions, the minor inaccuracies and all the other points one might quibble about.

There are endless lists. As lists go they are very good and undoubtedly they give a maximum amount of data in compact form. They are always difficult to read and dull.

This is a book for your reference shelf. It will supplement some of the old timers and supplant others.

The Garden in Color. Louise Beebe Wilder. The Macmillan Company, New York, 1939. 327 pages, illustrated in color. \$2.95.

This is a reissue of a book that first appeared at a much higher price in 1937. It seems to be identical with the original issue and now is in reach of all.

A Second Book of Plant Names. Willard N. Clute, published by the author, Indianapolis, Indiana, 1939. 164 pages.

The last line of the preface reads, "That a perusal of the book may stimulate others and further investigations of this interesting subject is the hope of the Author."

Whether one is stimulated to investigations or not, this book is well worth reading since it touches upon many matters that perplex the beginning gardener and the older gardener as well.

Much well-deserved fun is poked at various theories and practices, much factual material and reported plant lore are presented. No special conclusions are offered, save by implication.

Practical Lawn Care. M. G. Merritt. A. T. de la Mare Company, Inc., New York, 1939. 32 pages, illustrated. \$0.75.

This booklet, which is scarcely longer than a magazine article, gives in terse and interesting fashion the essentials for making a good lawn and keeping it. It does not give formulae for seeding. Read it by all means; profit by its advice which is well and clearly given.

A Classified List of Tulip Names. Published by the Royal Horticultural Society, London, 1939. 119 pages, paper covers 2 shillings, cloth covers 3 shillings; 2 pence additional for postage.

This is an annotated check list of tulip varieties and represents the work of the Narcissus and Tulip Committee of the Royal Horticultural Society, which has cooperated with the General Bulb Growers' Society of Haarlem since 1928 in a study of tulip varieties. It contains "4,300 names of which about 500 are synonyms." "The classification of each variety, according to the revised system is given, together with a brief colour description and, when known, the name of the raiser."

Gardening in East Africa. Edited by A. J. Jex-Blake. Longmans-Green and Company, New York, 1939. 388 pages, illustrated. \$5.00.

This is a modified and enlarged second edition of a volume that first appeared in 1934. It has innumerable contributors, some who sign their names and many who do not. It is essentially a joint enterprise of many who have combined their knowledge and

experience to make a handbook for East African Gardeners.

The materials fall into the familiar organization of the general horticultural guide but are greatly reinforced by the chapter on climate and, to a lesser degree, to the chapter on soil.

To the American reader, the book is most interesting in what it has to say of plants native to the area. One looks over the colored plates and sees plants known only as illustrations in older books or as relatives of exotics introduced into Florida or California. The book is not a source book, however, and one finds that much that might have been said, even in passing, is left out. To the reviewer, who happens to be keenly interested in nymphaeas at the moment, the chapter on Water Plants is irritating beyond measure, since the native species are passed over too lightly and incompletely.

The book was not written for such as the reviewer, however, and doubtless serves well in the territory for which it was written and in other somewhat similar areas for which there are no texts at all.

Earth's Green Mantle. Sydney Mangham. The Macmillan Company, New York, 1939. 322 pages, illustrated, \$3.50.

Professor Mangham is Professor of Botany, University College, Southampton, England, and has many distinctions past and present.

His present book is a popular presentation of the importance of the plant kingdom to man and animals now and through the ages. That so much data can be compressed into so readable and short a book is in itself an accomplishment. It is the sort of thing that cannot be properly reported in any review, no matter how long or detailed. Even a recapitulation of the chapter headings gives little suggestion of the contents.

This book is seriously urged upon our members who are interested in knowing something of the plant world.

A Partner of Nature. Luther Burbank. Edited by Wilbur Hall. D. Appleton-Century Co., New York, 1939. 315 pages, illustrated \$3.00.

To quote from the jacket, "Here, for the first time, the vast amount of material written by Luther Burbank, during his lifetime is compiled and compressed into a single volume. 'Partner of Nature' contains the cream of what the great naturalist had to say about his revolutionary experiments in plant breeding."

In the preface, his widow states, "The experiences, theories, laws, methods and formulas set down are entirely Mr. Burbank's."

One reads the volume with a little sadness since from it emerges nothing new, nothing revolutionary, only the same story of the kindly person with a keen eye and imagination. There are no new principles or methods and probably were none even while he lived, so it seems unfortunate that this need be pointed at again.

Propagation of Horticultural Plants. Guy W. Adriance and Fred R. Brison. McGraw-Hill Book Co., New York, 1939. 314 pages, illustrated, \$3.00.

This is a text book, which determines, within limits, both its content and its type of presentation. It appears to be such a text as might be used by those first approaching the definite study of the subject. Since this is so, all that can be expected of the authors is that they cover the familiar field in the light of present day knowledge and experience and present their data in as lucid and engaging a style as possible.

The style of presentation is certainly

lucid. It is not particularly engaging. The subject matter is fairly well covered in all fields save perhaps the section discussing growth substance for cuttings. It must be remembered, however, that that field is constantly enlarging and altering, so that any pronouncements might easily be outmoded or incomplete after printing.

The illustrations for the most part are rather poor and are either poorly engraved or poorly printed for in many cases the purpose of the illustration is obscured so that only the person who knows in advance could discover the point illustrated.

In many cases the plants chosen to illustrate principles and practices are plants that reflect the extreme southern experiences of the authors.

The plants chosen and treated most in detail suggest the idea that the authors have in all cases had in mind the problems of commercial propagation as considered by the nurseryman, rather than the academic problems of the research worker or the small queries of the amateur.

Where Did Your Garden Grow. Janette May Lucas. J. B. Lippincott Co., Philadelphia, Pa. 1939. 67 pages, illustrated by Helene Carter. \$2.00.

This is a very pleasant juvenile, which might well be read by some not so juvenile. The movement of plants about the globe resulting from man's love of gardens and his passion for taking to the new land flowers from home, is well set out.

Much research lies back of its limited text, so if occasional slips are found, such as the zinnia growing out of Brazil, and the like, one must not be too captious, for the text merely says South American, which is not Mexico, or even Chile—and so. . . .

The American Colorist. Faber Birren. The Crimson Press, Westport, Connecticut. 24 pages, 12 color charts. \$1.00.

The question of a useful color chart that need not cost too much nor be too cumbersome has long confronted the garden world. The present volume is certainly inexpensive, simple to use and easy to carry about. The plan on which it is devised seems excellent and the vocabulary that it will produce certainly will not be as horrendous as that resulting from Ridgway for example, but some of the resulting combinations will have a quaint sound in our ears. For example, Light Weak Tone Jade and Dusky Grayish Tone Turquoise are almost as funny as Pale Venaceous Bluff or Pleroma Violet.

The most serious fault of the book, if it is to be used in serious color notation for garden records, is that it has no cross reference to other older color charts. After official records have been taken by one chart for over twenty years, it is hard to believe that any idiot can be found who will translate twenty years' work into this current idiom. So perhaps, the book will be used only for new projects or by those who only think they are going to be technical!

The Gardener's Pocketbook

Notholirion Thomsonianum (Royle)
Stapf (See page 295)

Relatively speaking, *Notholirion Thomsonianum* is a new arrival in the world of ornamentals. It has been known to the western world for just about a century and then, primarily only in botanical collections. In fact, there appeared in *Gardeners' Chronicle* of London, as recently as 1932 a note about its successful culture in an English garden, which, quite likely, represents one of the early successes with the plant in the hands of a private gardener. In the United States, even in botanical gardens, it is not well known.

Under the circumstances, it seems remarkable that the taxonomic history of the plant should be so involved as to require very careful study in its analysis. It would be useless to detail here all of the confusing situation. As understood today, the genus *Notholirion* includes three very closely related species. From the synonymy, it appears that each species has been confused with the other two by each of several eminent botanists. Furthermore, each has been placed at some time in both of the related genera, *Lilium* and *Fritillaria*. The late E. H. Wilson in his "Lilies of Eastern Asia" seems to have been the first to restore order out of the chaos in his treatment of the group as the subgenus *Notholirion*. Finally, Dr. Stapf¹ of Kew, just before his death, accepted that species arrangement and concluded that Bossier² was correct in his evaluation of the group as a distinct genus.

It is with good reason that *Notho-*

lirion has been confused with *Lilium* and *Fritillaria*. It seems to belong somewhere between the two and possesses some characters of each. Its generic status rests essentially on the character of the bulb. This consists of a varying number of fleshy storage scales enclosed in papery outer coats formed from the old leaf bases. In contrast to this, the other two genera are without the outer tunics. There are also differences in flower characters, which, though difficult to define, are readily seen.

Of the three recognized species of *Notholirion*, *N. Thomsonianum* is the only one reported in cultivation. It was illustrated first by Royle³ in 1839 and again by Lindley⁴ in 1845 as *Fritillaria Thomsoniana* and *Lilium Thomsonianum*, respectively.

During the early part of the growing season, one sees only a rosette of long, linear, glossy, rich-green leaves which measures 6 to 10 inches in length. Leaves of the same character are formed along the base of the flowering stem which begins to take shape somewhat later in the season. The illustration shows how these leaves are reduced in size as the stem develops until they eventually become bracts.

One may see from the photograph the various positions assumed by the flower and its segments as they age. Flowering commences when the stems are no more than 6 to 8 inches high and continues for several weeks. The stems may finally reach a height of 3 feet. With flowers about 2½ inches long, a handsome display is maintained throughout the flowering period. The flowers of our specimens were white with a slight tint of mauve which faded rapidly as the flower aged. Each seg-

¹Stapf, O. Kew Bulletin of Miscellaneous Information 1934: 94.

²Boissier, E. Flora Orientalis. 5: 190. 1882.

³Royle, John F. Illustrations of the Botany of the Himalayan Mountains. t. 92, fig. 1. 1839.

⁴Lindley, John. Botanical Register 31: t. 1. 1845.

ment had a dot of green at the tip. It is said that in the past some flowers from this lot of bulbs have had a deeper tint of mauve. Even so, they have lacked the rose or lavender color this species is supposed to develop. In the length and narrowness of the perianth segments, our specimen fails to agree completely with the forms in the illustrations cited above, but there is no serious discrepancy. No mention is made in the literature of the sparse development of fine wool-like hairs on the young flower buds and bracts. The literature does mention, however, the fragrance of the flowers. Indeed, such a delightful perfume scarcely could be overlooked.

As noted above, the bulbs of this plant differ from those of the related genera in the presence of outer enclosing tunics. As in *Lilium giganteum* and its near relatives, the bulb is monocarpic. A relatively small bulb, at flowering size, it is no more than 1½ to 2 inches long and 1 inch in diameter. After flowering, the mother bulb breaks down into a number of small bulbils which form at the base of the storage scales. Even before flowering, there is a prolific increase. From about 200 bulbs, most of which did not flower, about 2,000 new bulbs were harvested. Both the small and large bulbs are essentially alike in appearance. The papery coats are dark brown, and marked with 5 or 6 longitudinal ridges or lines.

Culturally, *Notholirion Thomsonianum* must be classed as a tender bulb. Its cold endurance in this country is not definitely known, but presumably it will be satisfactory only in the milder parts of the Pacific Northwest and in the deep South. Possibly it may tolerate the winters of the Atlantic Coast as far north as Norfolk, Virginia.

In the greenhouse near Washington, it has been the practice to plant the bulbs in pots or flats in good potting

soil (of acid reaction) in October or early November. Leaf growth starts immediately, and the leaves remain active until early June. Flowering occurs during late March and early April. It is said to grow in limestone soils in its native home in South-central China, and in England the best results are reported in such soils.

Styrax officinalis Linnaeus (See page 297)

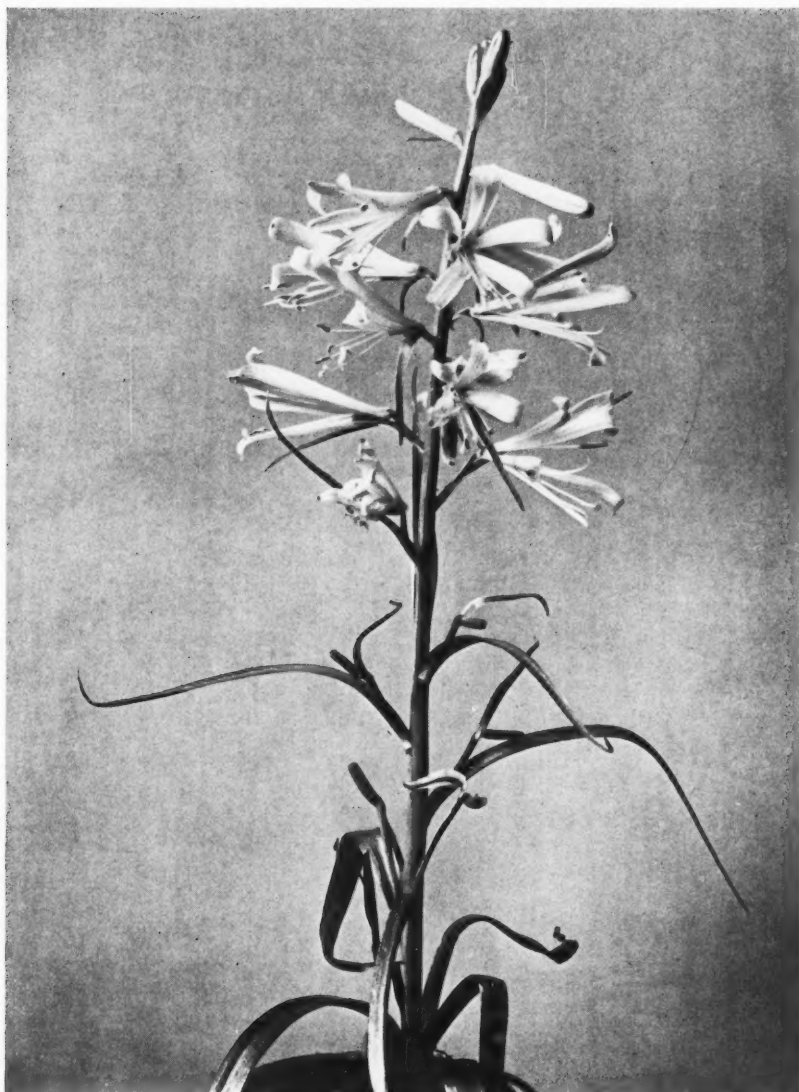
The subject of this note is not a new plant in any sense; it is not even a rare plant. Neither is it a common plant. Until the late Eighteenth Century it was an economic plant; since then it has made its way as an ornamental.

In its ornamental qualities, *Styrax officinalis* must be classed as inferior, at least in some respects, to *S. japonica* and *S. obassia* (National Horticultural Magazine 12: 273. 1933). It does not carry the wealth of flowers of the first, nor the bold leaves and graceful inflorescences of the second. In spite of these deficiencies, it is worthy of a place in the gardens of the South.

The plant habit is more that of a shrub than of a small tree. It branches freely and though somewhat open, it assumes a graceful shape. It is readily trained as a small specimen tree, however, and as such, may grow to a height of 20 feet. In either case, the soft green of the leaves and the fragrance of its flowers, produced from April to June, make it a useful plant.

Almost all parts of the plant are pubescent, even the petals and filaments of the flowers possessing a stellate tomentum. On the leaves, this occurs only on the lower surface. In shape, the leaves are ovate-orbicular and obtuse. As in the photograph, the flowers are always pendent.

As late as about 1750, *S. officinalis* was the source of an aromatic gum-



Claude Hope

Notholirion Thomsonianum

[See Page 293]

resin which was used in medicine and apparently as a fumigant and a sort of incense. As such, its use goes back into Grecian times. Dioscorides tells of its preparation. As it is native to the Mediterranean region, it was used by all the peoples of that area. Even into more recent times, it is said that storax plants formed a part of the maiden's dowry among certain of the peoples of Asia Minor. Since about 1750, it has been replaced as a source of storax bark by *Liquidambar orientale*.

No particular care is required in the cultivation of the plant, nor does it seem to have any particular soil preference. It is not hardy out of the deep South; southern Virginia probably marks its northern limit. As cuttings root very poorly, propagation is by seeds.

Mid-August, 1939

The flower borders in the garden of the stay-at-home gardeneress who aims to keep it tidy with the aid of only occasional help should look very well at this season—and they do. One takes a bit of gleeful pride in them in contrast to those on the “estates,” whose head gardeners often let them go to seed in July and August when the families are abroad, meanwhile concentrating on their dahlias and chrysanthemums for the autumn shows.

The borders of the stay-at-home gardeneress are treated in a broad-minded catholic fashion of getting a good thing in and letting it multiply, then there is little to do but the de-shooting of the Michaelmas daisies; the beheading of all phlox as soon as it goes out of bloom; the tying down of bush clematis or a seedling clematis in stray corners; the pegging down of sunflowers and so forth. This pegging down has never been very successfully done here; one wonders if Miss Jekyll used hairpins,

now alas almost out of use anywhere, or bent twigs—she often refers to the method but not to the tools.

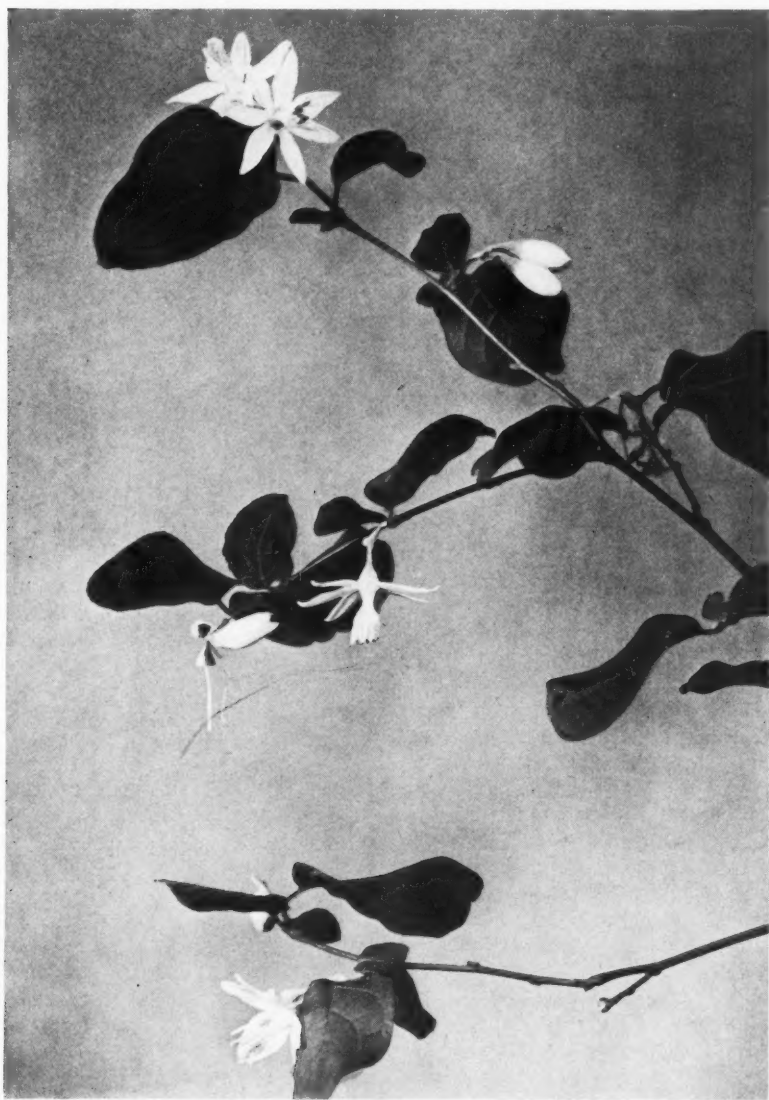
In June the few annuals needed may be set out where space permits or is made, for there is very little space with these encroaching perennials, and none by August. Certain zinnias are always necessary, white, and that soft fawn or buff Isabellina, very difficult to get. This year my packet produced brilliant orange and deep soft crimson, as well as the true Isabel. Marigold Supreme is the best marigold, its soft shade of yellow harmonizing beautifully, but the Japanese beetles love it and it usually survives as a skeleton too weary to take up the business of blooming after its long struggle with the pests. Marigold Harmony, one of the novelties that is good, is fine for front places in the border as it is really bushy and not too tall, its red-gold and bronze flowers blending well. White petunias are used along the edges, mingling with the mats of silvery lamb's-ear (*Stachys lanata*).

A Mexican primrose, *Oenothera speciosa*, large white flowers with yellow-green throat, is a lovely thing but a great ramper, so many shoots must be yanked out in spring.

Iris in a few good varieties are in clumps here and there. Bergamot never looked so well as this year when it had at last a good space of some five or six feet to itself with silvery-gray Echinops showing amongst it.

Chrysanthemums are safest transplanted from frames and staked late on a rainy day, they shift easily.

All the borders described here have high evergreen hedges against which the color shows beautifully. One border only that has no hedge background is divided from the rose beds by posts hung with *Clematis paniculata*. There is one high point during the last ten days of August and beginning of Sep-



Claude Hope

Styrax officinalis

[See Page 294]

tember when *C. paniculata* is at its best—as it has seeded about the garden, there is always unexpected pleasure in new arrangements made by a happy conspiracy between the seedling and nature, which delights the gardeneress more than any self-planned planting could. This year the fringe tree (*Chionanthus retusa*) has repeated its spring snow by a clematis flung aloft its top-most branches all frothy white. The high spruce hedge has festoons of the same, a bit too heavy for its own good, but this has been going on for so many years it is about time to lighten its load and cut back some exuberant ropes of it next spring. Stray seedlings appear around box bushes at ground level and some clamber over a group of white phlox now almost out of bloom.

The large-flowered clematis, fickle as usual, are over by now, yet some show again rosy red and pale pink in their proper places.

An experiment this year is beginning to fulfil itself though it may not reach full glory until frost ends it suddenly. This is the placing of Heavenly Blue morning-glory to clamber over the peonies on a central walk; it is only an early morning joy, but sufficient if it works.

Last autumn there had been too much goldenrod; one did not want the garden to look so like a country pasture. Much was dug up and thrown over the fence; also Michaelmas daisies were drastically reduced and only the very best progeny of aster Climax and the whitest of some heather-flowered kinds kept. In spring one can not be sure of the various blues, so it is safest to have only Climax. Then, in deshoooting in spring, space them quite far apart. The effect of the colors will not be known until September, but the grace and proportions of these single stems of aster are so lovely even before they bloom.

After beheading the phlox in July, of course there is another general guillotining of everything in the way of asters and so forth lest the whole place become a wilderness the next season, but one can wait almost to November before this takes place and all stems should be gathered up and burned as the seeding goes on so fast.

F. E. McILVAINE.

Glen Isle Farm,
Downingtown, Pennsylvania.

*From the Midwest Horticultural
Society*

Daphne mezereum

A shrub which is seldom seen in cultivation in the Middle West is *Daphne mezereum*, called February Daphne because of its early blooming period. It has an upright habit growing two to three feet tall with slender light green leaves which are grayish underneath. It is the hardiest of the Daphnes in this area, since the choice *Daphne cneorum* is somewhat tender.

The reddish-purple intensely fragrant flowers bloom in March before the leaves appear. They come in three-flowered clusters close to the branches and are followed by scarlet berries in August. It may be well to mention that both the leaves and berries are poisonous if eaten. This shrub is more at home in an alkaline soil in a well-drained position. I have noticed that in a heavy soil that is kept too wet the plant will weaken and die. A sunny exposure is necessary for a well grown specimen.

Hydrangea petiolaris

A choice novelty for stone or stucco walls, up which it will climb by means of its aerial roots, is the Japanese Climbing Hydrangea, *Hydrangea petiolaris*. This is a slow vine to establish



Lilian A. Guernsey

Jasminum nudiflorum

[See Page 302]

itself, but once it gets a good start there are few vines more ornamental. The broad leaves are long-petioled, overlapping like shingles on a roof, and the wide spreading, lacy panicles of flowers are very showy and deliciously scented, resembling *Clematis paniculata*.

Under good cultivation it will reach a height of ten to twenty feet. I observed a fine plant in one of the suburbs of Chicago growing on the north side of a building and it is growing also at the Morton Arboretum. For the first 2 or 3 seasons protect the young plants by wrapping in straw or burlap during winter. Preventing it from blooming for several seasons would aid the plant in becoming established. Prune in early spring and remove all the very thin, weak shoots and cut back far enough on strong wood to produce healthy shoots. When flowering shoots appear cut them off.

Another vine confused with the Climbing Hydrangea is *Schizophragma hydrangeoides*, another native of Japan, but inferior in every way. The latter can be distinguished by the solitary sepal of the sterile flowers, the rougher splitting bark on the old stems, and the smaller, more orbicular leaves.

Koelreuteria paniculata

The only yellow flowering tree hardy in this region and one that is still quite rare is the Goldenrain-Tree, *Koelreuteria paniculata*. It does not produce a straight trunk, usually appearing somewhat misshapen or with several trunks. I would recommend it only as a small lawn tree for its compound leaves and ornamental flowers in midsummer. The tree is short-lived and only reaches a height of about 25 to 30 feet. It should be grown only in a sunny, sheltered position in our climate.

The pinnate leaves are alternate with 6 to 15 three-lobed leaflets which are

incised. I have found it well suited to city conditions, tolerating smoke and gas better than the majority of trees. The flowers are borne in panicles at the end of the branches and are carried well above the foliage. Blooming in July when few other trees are in flower, it is a handsome object with its bright yellow flowers marked with orange red at the base. The flowers open gradually so the tree remains showy for several weeks. Later in the summer numerous conspicuous bladder-shaped pods adorn its branches. Another point worthy of note is the fall coloring, the leaves turning yellow before they fall. The Goldenrain Tree is one that can be recommended for hot, dry places. However, I have 2 trees which seem to be thriving in a semi-shady location.

Ilex opaca

Although extremely slow in growth the American Holly, *Ilex opaca*, can be grown here if given a favorable location and a little extra care. It will remain shrubby in habit, never reaching the tree like proportions of the fine specimens I have seen in Tennessee and farther south. A semi-shady spot sheltered from the wind in a soil that is naturally moist, would be preferable. However, if the soil is rather light and not too rich the plants will winter much better. Under these conditions they will not make as much growth, but by making a stocky growth the plants are able to ripen the current season's wood before winter comes.

The leaves are thick, dull green above, somewhat wavy and bear spines along the edges. When clipped to promote a dense growth the pruning should be done between the leaves as the leaves when cut have brownish edges that detract from the general appearance of the plant.



Robert L. Taylor

Buphane ciliaris

[See Page 302]

Since hollies are dioecious plants, in order to secure the bright red berries it is necessary to have a staminate plant for every three or four pistillate ones. Their slow growth also accounts for the lack of berries in this area. The only safe way to transplant an American Holly is with a ball of earth and it will help to strip most of the leaves from the branches before planting. The plant known best to me is growing at the Morton Arboretum in an exposed position with very little protection from sun and wind and yet it has withstood some very severe winters with little injury.

ROBERT VAN TRESS,
Garfield Park, Chicago, Ill.

Jasminum nudiflorum (See page 299)

This plant is no novelty but one does not see it as commonly as one might and many persons, seeing it without looking closely report to their amazed friends that they have seen forsythia in flower! This is always annoying to the lover of this plant since here at least it always gives scattering bloom in winter and full flower weeks before forsythia. Two obvious things these plants have in common, yellow flowers before the leaves and a convenient habit of rooting at the tips of the overarched branches.

For those persons who can grow other species of jasmine, this plant is possibly not needed but for gardeners who live where jasmines are tender, it is of value since it can be depended upon for winter flowers.

It has long been a garden plant even in our countries for it was one of the plants sent home by Fortune among those memorable plants he sent from China. It was illustrated in color in the Botanical Register in 1846 and in the Botanical Magazine in 1852.

In the Botanical Register Mr. For-

tune is quoted "This species was first discovered in gardens and nurseries in the north of China, particularly about Shang hae, Soochow, and Nanking. It is deciduous; the leaves falling off in its native country early in autumn, and having a number of prominent flower-buds, which expand in early spring,—often when the snow is on the ground—and look like little primroses.

"It is easily multiplied by cuttings or layers, as it has a tendency to throw out roots at the joints of the stem. The Chinese often graft on the more common kinds, about a foot from the ground, which improves its appearance. Any common soil will suit it, and it will answer well for rockwork, or small gardens where sweet flowering shrubs are desirable."

All of this still stands save that we scarcely need graft it and certainly do not want it in any rock garden of moderate dimensions.

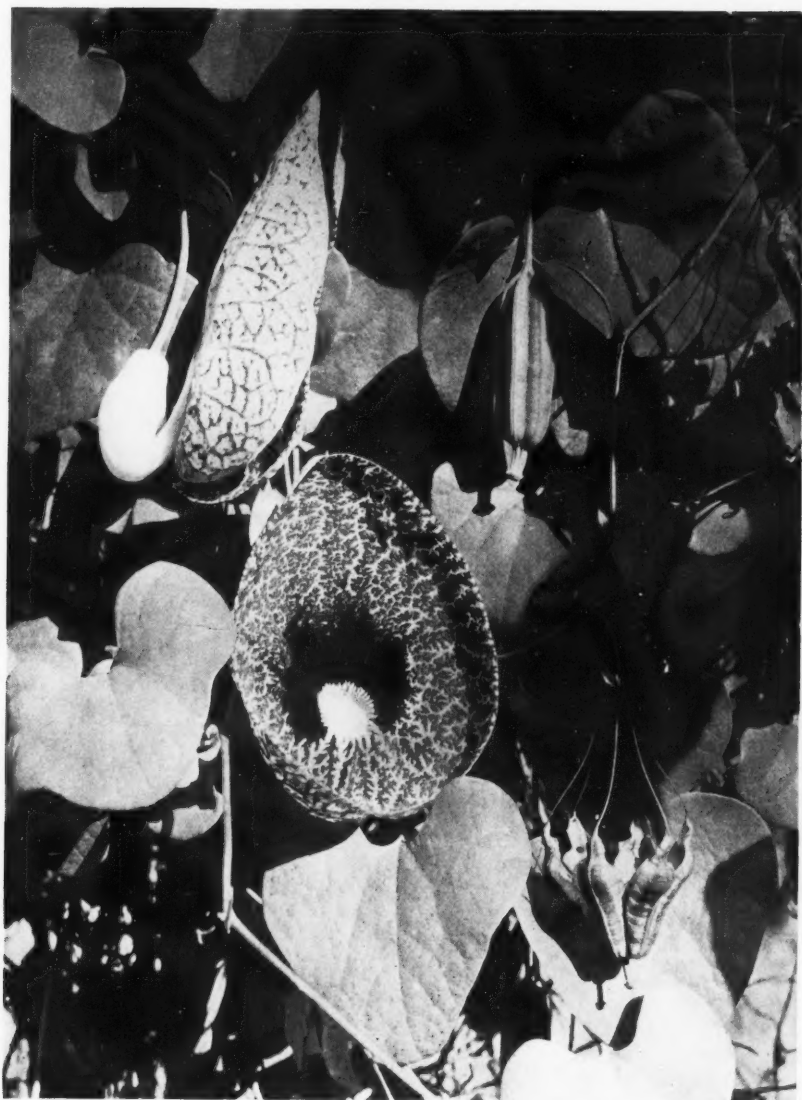
It might be added that it looks well on banks and once established, holds them well. It stands shearing well and can be trimmed into almost formal shapes though this destroys the fine arching style that shows in the illustration.

As the new wood is green, it makes a very distinct color note in winter.

Buphane ciliaris (See page 301)

Among the many interesting amaryllids in South Africa are the Buphanes represented by two species which one does not often see in cultivation.

As grown in pots, the large bulbs with their many coats are planted with a fair portion above ground in a rich but well drained mixture such as one might give hippeastrums. In the species *B. disticha*, the leaves are beautifully arrayed in two ranks, making an almost architectural pattern. The leaves of this species are less numerous, short



H. F. Loomis

Aristolochia elegans

[See Page 304]

er and less regular in their arrangement.

They follow the production of the amazing inflorescence. The illustration shows the thick but somewhat flattened peduncle and the great number of flowers borne on stalks 6 to 8 inches long.

The colors are beautiful but not striking. The peduncle and flower-stalks are a creamy yellow. The spreading perianth segments are chocolate purple with a pinkish flush running down from their bases over the ovary to the flower-stalks. The stamens are dark with light, almost white, anthers and the pistil, which is not conspicuous, is almost entirely white.

As the flower-stalk develops, the bracts that inclose the umbel of flowers breaks and the ruddy flower buds show in rather stiff array, but the individual flower-stalks develop quickly and take a radial arrangement to give the spherical appearance shown in the illustration. Not all the flowers open at one time and the fading flowers die gracefully as the ovaries develop into greenish three-sided capsules bearing the whole inflorescence in an attractive state for weeks.

Our plants were self-pollinated but no good seed resulted, a matter of considerable regret as the bulbs do not show signs of rapid natural increase.

It is doubtful if one should displace showier amaryllids by this plant, but it is an arresting sight when in flower.

In the Botanical Register, where it was figured (t. 1153) (1828) is a contrasting note.

"This plant, although very common in collections, and cultivated in England for at least seventy years, produces its flowers so seldom, that there are few persons who have ever seen them. Even Mr. Herbert, to whom

everything relating to this tribe of plants is familiar, appears to know its blossoms only from a specimen in Mr. Lambert's Herbarium."

No references have been found to show whether or not this species contains the poisonous alkaloids that distinguish the other species, *B. disticha*.

Aristolochia elegans (See page 303)

This genus, which has so many astonishingly shaped flowers, has in this rather familiar species one of its least bizarre representatives. Most of us who have seen it have known it only as a greenhouse vine of not too luxuriant growth, moderate sized grayish-green leaves and rather handsome flowers that are really more handsome than to deserve the common name of calico flower.

The ground color of the corolla-like calyx is an off white that seems whiter than it is because of the definite pattern of the markings and the velvety intensity of the more solid portions. The color of the pattern is that familiar plant color that may look black, chocolate purple or even deep brown according to the light.

Unlike most of the species, this plant does not have flowers with the characteristic unpleasant odor of the genus which gives it somewhat of an advantage over its fellows.

Although native to Brazil, it is not as imperative in its heat requirements as some of the more tropical species. This fact and the fact that it flowers when rather young makes it a possible house plant for Northerners, as well as a good vine for the warmest regions in our South.

It is easily raised from seed which is freely produced and carried in the typical hanging capsules that split open to look like baskets.



Lilian A. Guernsey

Tritonia hyalina

[See Page 306]

Tritonia hyalina (See page 305)

This species does not belong to the section of the genus in which is found the familiar montbretia, but is rather at the other end of the line with a smaller plant and lower inflorescence that suggests somewhat that of the freesia. The flowers, of course, are entirely different.

Of the species more commonly cultivated to which this might be compared, *Tritonia crocata* is the one most often offered in the autumn bulb lists and, like freesias, some of the winter-flowering gladiolus, ixias and such, is a plant much more suited to winter growth in the greenhouse with March flowering than outdoor planting except in the Gulf or Pacific Coast States. These regions are, of course, a law to themselves.

Treated rather like freesias, the small corms send up a montbretia-like fan of leaves from which rises the foot high stalks. These are somewhat irregularly overarching, with several flowers borne along the upper portion as the illustration shows.

The feature that gives this species its name is the semi-transparent margin of the bases of the perianth segments which are narrower than those of *crocata*.

The character that gives the plant its distinction as a flower is the brilliant apricot to salmon to orange color of the floral segments, a color that diminishes very little in intensity as the flowers develop after cutting.

In Curtis' Botanical Magazine, B.M. 704 (1804) the color is given as "Corolla bright vermillion, varying to a deep fiery orange colour." Our plant, raised from imported stock, showed no such variation in color and is a much more attractive plant than that of the figure cited.

Nearly every flower will develop

after the stalk is cut and the older flowers when withered are less unseemly in their decadence than either freesia or ixia.

After flowering the plants are allowed to make full growth and then become dormant, in which stage they can be stored until the following autumn.

Butterfly Lilies (See page 307)

OLD Southern gardens owed much of their delightful charm to the quantities of plants which were lovingly cultivated for their exquisite perfumes. The recent revival of interest in sweet-scented gardens has resulted in the renewed use of many fragrant favorites of other days. Of these, the Butterfly Lily, often called the Ginger Lily, exceeds all others with the delightful fragrance of its large clusters of snow-white flowers during the late summer and fall months.

Classified as *Hedychium* or *Zingiberaceae* the lilies are natives of Asia and have been naturalized extensively in tropical America. The generic name *Hedychium* is from the Greek meaning sweet snow, in reference to the glistening white flowers. Many varieties are grown in different parts of the world. The flowers are cultivated in Persia for the manufacture of perfumes, while in India, the plants are valued for their beauty and use in religious ceremonies. A lemon-yellow variety, *H. gardnerianum*, which comes from Bengal, is prized as a hardy midsummer bloomer in gardens of Cornwall, England. The variety grown in Southern gardens is *H. coronarium*, and is sometimes called garland-flower.

Butterfly lilies are greatly prized as cut flowers because of their beauty and their exceptional keeping qualities. The fragrance is delicate rather than heavy, and a single graceful spray will permeate an entire house with its subtle

*Hedychium coronarium*

[See Page 306]

perfume. The individual blossoms are frequently scattered at intervals along polished luncheon tables or placed in finger bowls, as the butterfly-like formation of each flower is unbelievably lovely.

The ornamental plants are tall, usually three to six feet, and are similar to cannas in growth and appearance. The foliage is a pleasing shade of light green of a satiny texture. The plants are rarely troubled with insects and the

cultural requirements are simple, consisting of plenty of water, rich soil and occasional feedings of fertilizer. The lilies are propagated by division of the sturdy rootstocks during the winter or early spring months. These roots, which are said to have a distinct taste of ginger, should be planted shallow in semi-shaded locations. After the flowers have bloomed or been cut, the remaining leaves gradually turn yellow and should be cut off within a few inches of the ground. Butterfly lilies are a permanent addition to the garden and need not be disturbed except for division every four or five years. Almost the entire supply of roots comes from old Southern gardens, although they are occasionally listed by Reuter of New Orleans.

Butterfly lilies make excellent ornamental greenhouse plants and should be grown more generally in colder climates. They are commonly grown under glass in England and Gertrude Jekyll frequently mentions them in her books, particularly as companion planting for *Daturas* in large conservatories.

FRANCES HANNAY.

The White Ladyslipper

Bergen Swamp, not far from Rochester, New York, is the home of several rare plants. The White Ladyslipper, *Cypripedium candidum*, is one of these natives uncommon in the East. It is the least known and grown of our showy Orchids.

Two friends and I made a trip one May to this swamp well known to naturalists and scientists for many decades. It covers several hundred acres and is mostly a dense growth of White Pines, Larches, Arbor Vitas, and tangled underbrush. We were unfamiliar

with the area and, although well supplied with topographic and sketch maps, it required considerable time to locate the marly open space where the *Cypripedium* grows. The warm, humid air and clouds of mosquitoes which followed us everywhere did not add to our enjoyment, but one cannot expect comfort in a swamp!

Juniperus horizontalis, the Creeping Juniper, a rare plant in the state, formed an almost solid border around the marl area, which is covered by a few inches of water. We splashed across this shallow "pond" and were covered to the knees by the sticky, white mud. The Ladyslippers were at their best, the small, white flowers standing out against their background of dark green Junipers. The plants are a foot high and the relatively narrow leaves point rigidly upwards. There were numerous plants in bloom and many young ones, but the total number was not nearly so great as one might reasonably expect.

The promiscuous and thoughtless collecting which has gone on for years, and still occurs, has decreased the population of many of the rare plants in Bergen Swamp. The Swamp Rattlesnake, too, which once was abundant in the swamp but not found in the surrounding region, is becoming scarce. Besides the effect of over-collecting such a small area, there is the ever-present danger of "progressive" individuals wanting to drain the swamp to "improve" the countryside. A group has been organized in Rochester for the purpose of conserving the flora and fauna of this unique bit of land. I hope that its work is successful and that Bergen Swamp can be maintained in its natural state.

WARREN C. WILSON.



W. C. Wilson

The white ladyslipper grows mostly around the edges of this moor area

Oncoba Routledgei (See page 312)

It is perhaps absurd to show an illustration of this tropical shrub from Africa when only a small seedling plant is available for photographing, but the curious sight of many small seedlings bearing perfectly normal flowers so early in life, prompted the action.

If the mature plant can be as fine in its full stature as are these small plants we have here a desirable plant for our warmest regions and according to Bailey's *Cyclopedia* a useful shrub for greenhouse decoration.

The general characters of the leaf, spiny stem and flower show quite clearly in the illustration which suggests the dark green lustrous leaf character, the glistening white of the petals and the clustered gold of the stamen masses. It cannot suggest the pleasant scent. In a very general way the flower suggests the same beauties that more

northern gardens can find in *Stewartias* or *gordonias*.

Gloriosas

Although the plants were not unknown here, it was Mr. Wyndham Hayward called our attention to the possibility of growing them out of doors as one might *gladiolus*.

This was emphasized by field culture at the Introduction Garden where smallish seedlings went from pots to field and made most astonishing root development but less tops than one wished. The following year the story was quite different for the fine roots carried the food necessary to initiate vigorous growth.

One usually gets a root that looks more or less like a very long and poorly developed sweet potato. At one end is the scar of attachment to last year's flowering shoot; at the other, the grow-



W. C. Wilson

Cypripedium candidum and *Juniperus horizontalis*

ing point. One plants them on their sides, at an angle, something like grape cuttings. Planting must not start until after danger of frost is past.

Presently a vigorous shoot springs up with its amazing leaves, and finally its spectacular flowers. Mr. Hayward has described these for us before this and there is no need to repeat.

Planted in full sun and with light soil, the plants seemed more floriferous but less tall than those planted at the foot of Kampher's azaleas. Here they clambered through the leafy branches and hung out their flamboyant flower through midsummer.

After frost kills the tops, one digs down with care to discover two new storage roots from each stalk to which is attached the flaccid remains of the root planted in May. After this, cool storage in sand until another year.

Two Annuals

Among the several annuals tried for the first time in 1939 are two that we hope to illustrate and describe at some length during 1940. Mention can be made of them here as one, *Dichranostigma Franchetiana* had not succumbed to early frosts that had carried off marigolds, zinnias and nasturtiums, if not petunias.

The few seeds available did not germinate particularly well but the seedlings transplanted well in spite of being poppy relatives. In a general fashion

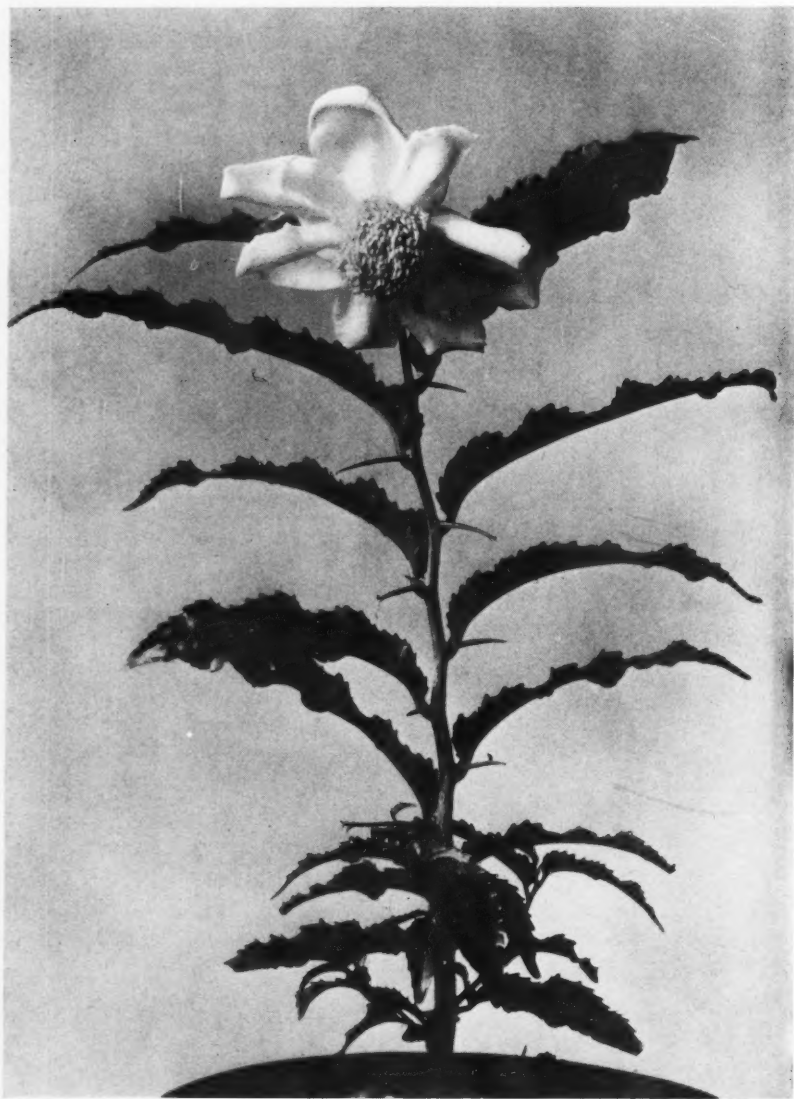
the plant resembles celandine with long, much lobed leaves and branching stalks that carried dozens of pale lemon yellow four-petalled flowers that last a day or more but follow one another endlessly from warm weather till freezing. The formation of new rosettes of leaves about the crown makes one wonder if this, like *eschscholtzias* in season may prove to be more than annual.

Set where its flowers had for background the deep blue starred masses of *Browallia elata*, this made a delightful addition to the secondary annuals.

In quite a different locality there grew plants of *Lavatera Loveliness* which is the one and only *lavatera* tried here that does not look like a weed. Although the seedlings were approximately alike, one or two plants seemed slightly more floriferous and one or two came into flower conspicuously later than their fellows. The color is a very decent rose pink—not a “mallow pink or purple” or a washed out lilac white such as one sometimes finds in *lavateras*.

It quite overshadowed another malvaceous annual planted nearby, *Anoda lavateriodes* which made equally vigorous plants with more cotton-like leaves through which rose small pinkish lavender flowers. The white form was much better.

Very interesting in detail were the charming seed pods, but we need not grow the plant just for these.

*Lilian A. Guernsey**Oncoba Routledgei*

[See Page 309]

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